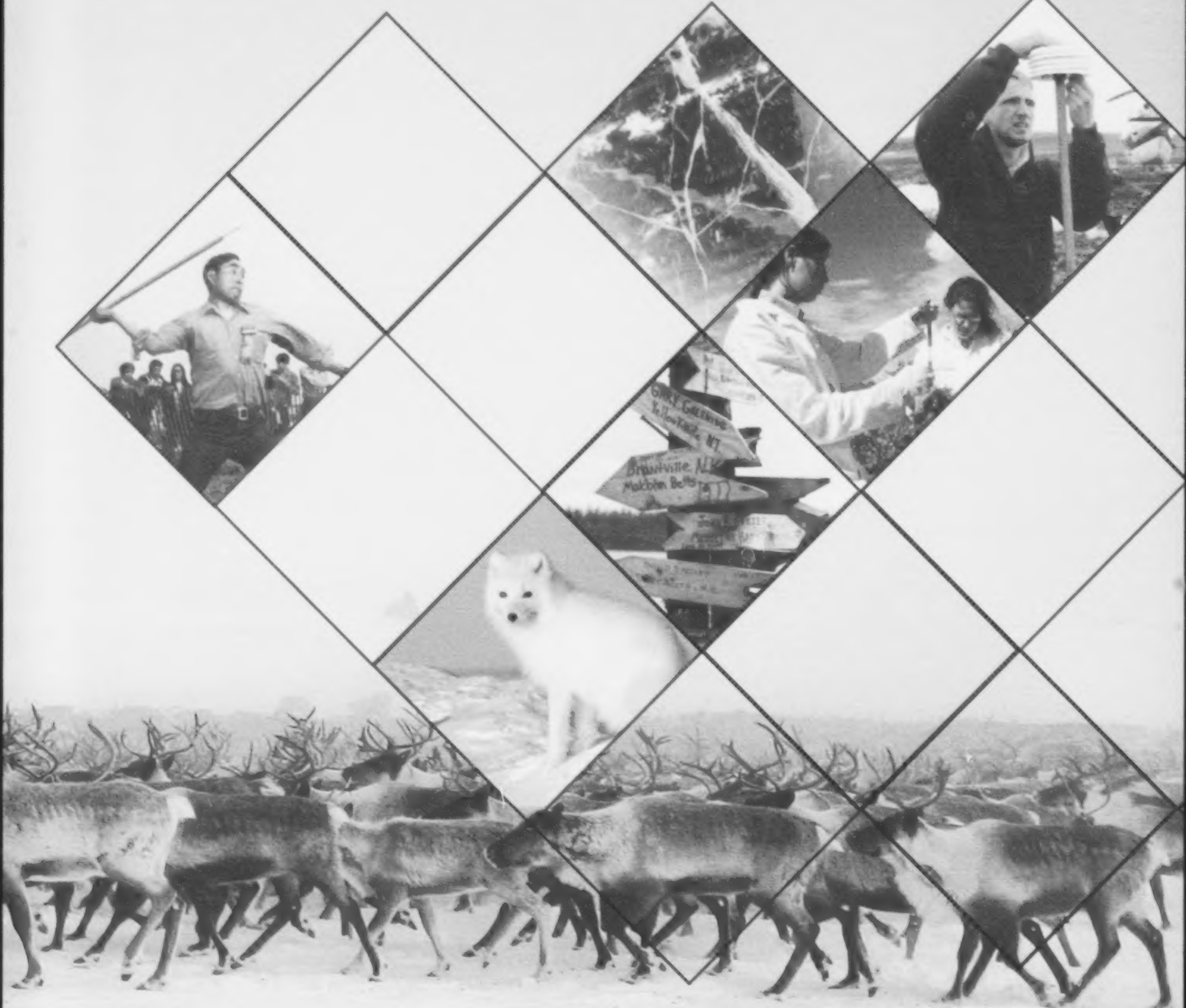
Compendium of Research in the Northwest Territories

2011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This publication is a collaboration between the Aurora Research Institute, the Department of Environment and Natural Resources, the Government of the Northwest Territories and the Prince of Wales Northern Heritage Centre. Thank you to all who submitted a summary of research or photographs, and helped make this publication possible.

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Northwest Territories Environment and Natural Resources

Northwest Territories Education, Culture and Employment

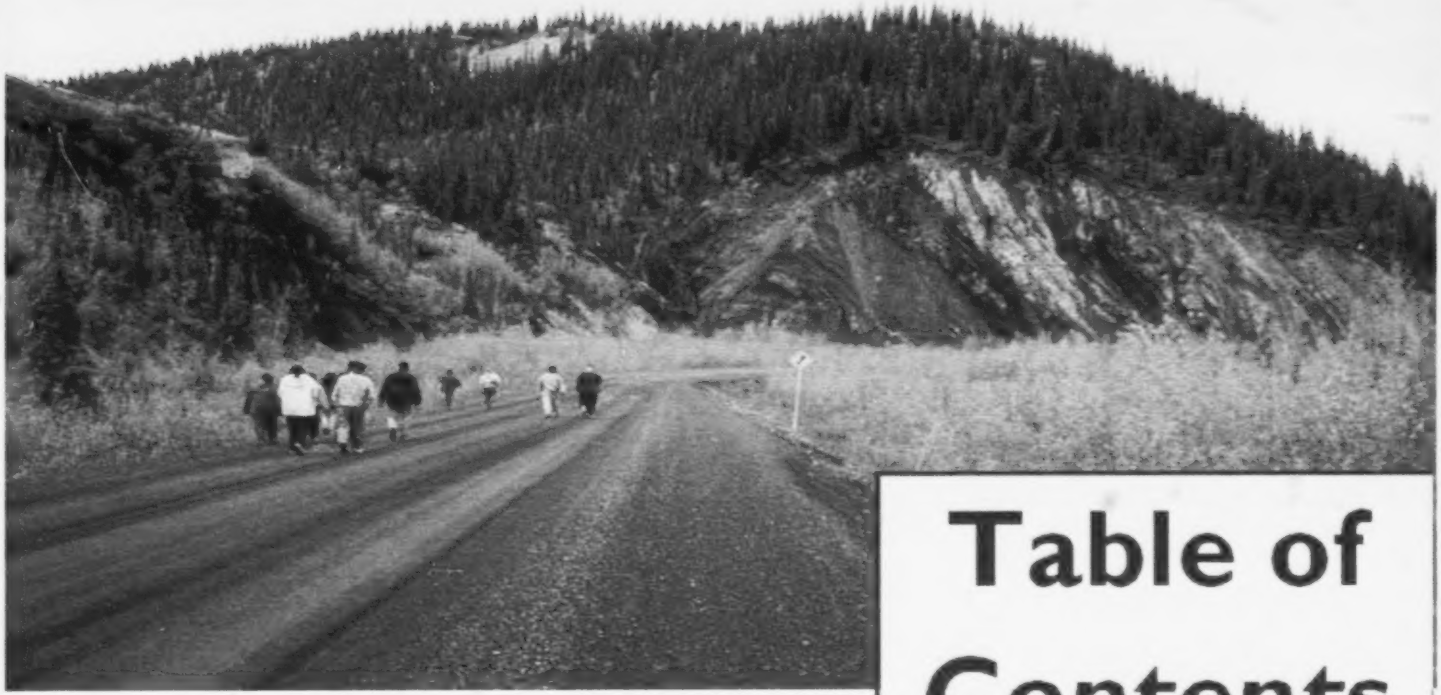
Foreword

The 2011 *Compendium of Research in the Northwest Territories* provides an overview of all research activities conducted in the territory, along with contact information for the researchers leading each project. It is a useful resource for gathering information on studies conducted across the territory, and provides plain-language summaries of research program activities taking place during 2011. The annual compendium is the result of collaboration between the Aurora Research Institute, the Department of Environment and Natural Resources and the Prince of Wales Northern Heritage Centre.

Although there was a slight decline in the amount of research conducted across the NWT following the end of the International Polar Year, 2011 found many regions across northern Canada benefiting from a renewed federal investment in research infrastructure. In September 2011, the NWT celebrated the opening of the *Western Arctic Research Centre* in Inuvik. This new facility was supported through the *Arctic Research Infrastructure Fund*, administered by Aboriginal Affairs and Northern Development Canada, and was one of twenty funded projects in northern Canada.

The *Western Arctic Research Centre* replaces the old *Inuvik Research Centre* after 47 years of continuous operation in Inuvik. The new state-of-the-art facility will expand research programming and research opportunities for the NWT. This renewed investment in research infrastructure will continue to support and build upon the rich and diverse range of research activity in the NWT.

Pippa Seccombe-Hett
Director, Aurora Research Institute
Aurora College



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Introduction

This compendium offers a summary of research licences and permits that were issued in the Northwest Territories during 2011. The information contained in this book is the product of a collaboration between the Aurora Research Institute (ARI), the Prince of Wales Northern Heritage Centre (PWNHC), and the Department of Environment and Natural Resources (ENR). The Compendium series began in 1986.

Licensing in the NWT

Under territorial legislation, all research in the NWT requires a licence or permit from one of three agencies, depending on the type of research being conducted:

Prince of Wales Northern Heritage Centre – archaeology research;

Department of Environment and Natural Resources, Government of the Northwest Territories – wildlife research;

Department of Fisheries and Oceans – fish and marine mammal research

Aurora Research Institute - all other research in the NWT.

Through the licensing process, researchers are informed of the appropriate organizations, communities and other licensing/permitting agencies that should be contacted prior to conducting studies. Licensing ensures research activities are communicated to interested parties and provides opportunities for the exchange of information.

The compendium provides a summary of all licences and permits issued in the NWT by all four licensing/permitting bodies. As each research project is represented by only a short abstract, the reader is encouraged to contact the researcher for additional information and results.

How to Use This Book

This book has three main sections. Each of these sections reflects a specific licensing agency and the type of licence or permit issued. Within each section, research descriptions have been grouped by subject and listed alphabetically by the principal researcher's last name. Refer to the Table of Contents for the specific page on which each section or subject begins. An index is included at the end of the compendium listing all researchers in each section.

1. File Number

The file numbers shown in each of the Aurora Research Institute's subject areas refer to the file number issued to a particular researcher. It allows cross referencing with research material that may be available on file or in the ARI library. The reference numbers of the other three agencies refer directly to the permit numbers given to each researcher. When requesting information from any of these agencies on specific research outlined in the compendium, please refer to the reference number in your correspondence.

2. Regional Abbreviations

Throughout the book, reference is made to the specific land claim region(s) in which the research took place. The regions are shown on the following page. Some of the land claim regions are still under negotiation and the boundaries shown are only approximations. The abbreviations shown for each region are as follows:

DC	Deh Cho	**SS**	South Slave
NS	North Slave	**SA**	Sahtu Settlement Area
IN	Inuvialuit Settlement Region	**GW**	Gwich'in Settlement Area

3. Glossary

A glossary of terms has been added to the Compendium. The intent of the glossary is to allow the reader to better appreciate the research descriptions.

4. Nomenclature for birds' names

Bird names are capitalized, according to the guidelines of the American Ornithologists' Union Check-list of North American Birds.

5. Archeologists Permit Classes

Class 1 permit – this permit entitles the permittee to survey and document the characteristics of an archaeological site in a manner that does not alter or otherwise disturb the archaeological site.

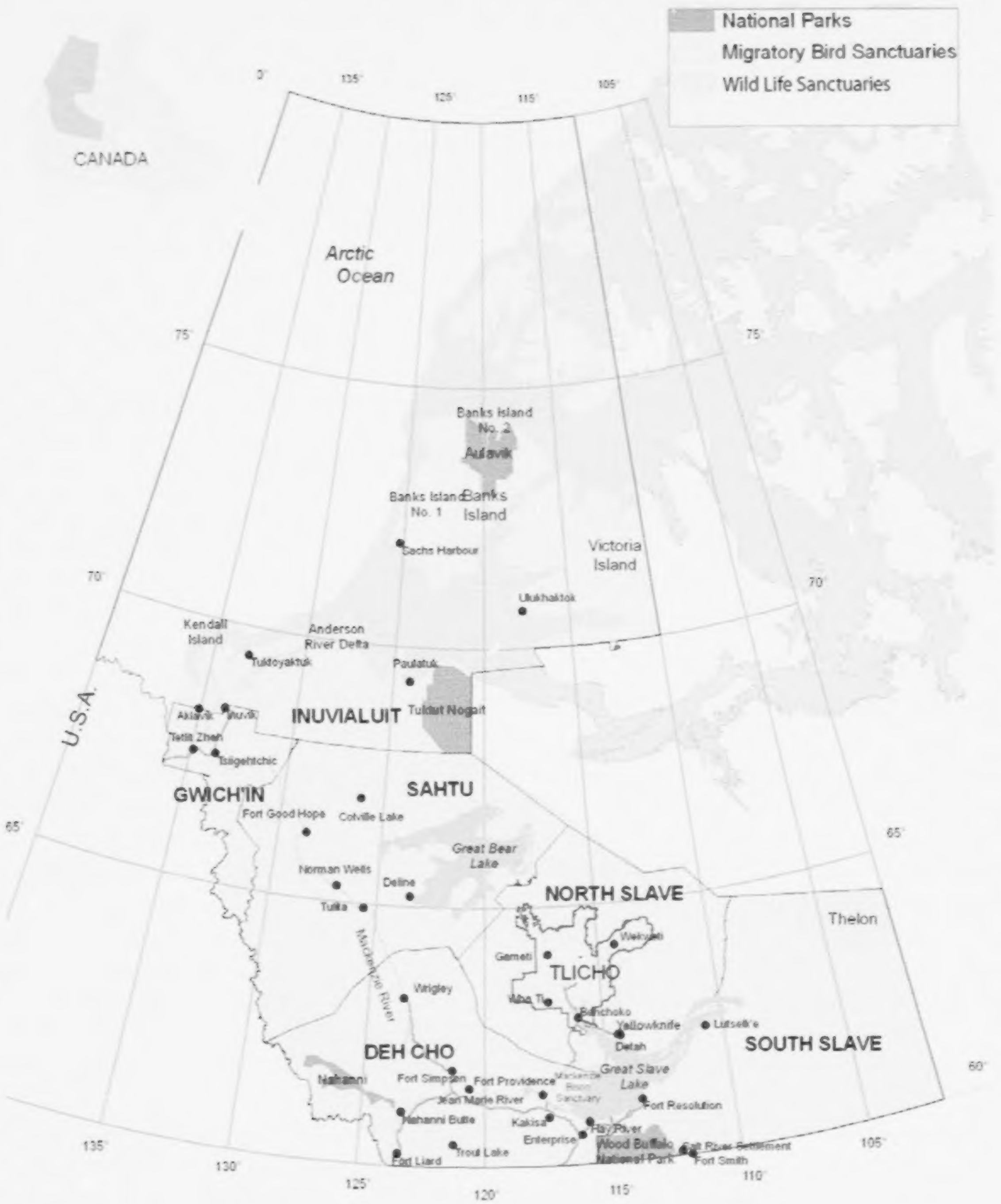
Class 2 permit - this permit entitles the permittee to:
(a) survey and document the characteristics of an archaeological site;
(b) excavate an archaeological site;
(c) remove archaeological artifacts from an archaeological site; or
(d) otherwise alter or disturb an archaeological site

Available in Print or Free Download

This compendium is available as a printed publication or can be downloaded from the Aurora Research Institute's website (www.nwtresearch.com). Copies can also be requested by contacting the Aurora Research Institute.

Send Us Your Comments

Whether you are a researcher or an interested member of the public, the Aurora Research Institute welcomes your comments and suggestions concerning this publication. Contact us by mail, fax, email or telephone (see address on page VI).


National Parks
Migratory Bird Sanctuaries
Wild Life Sanctuaries
CANADA
0°
135°
125°
115°
105°
Arctic Ocean
75°
75°
Banks Island No. 2
Aulavik
Banks Island No. 1
Banks Island
Sachs Harbour
Victoria Island
70°
70°
Ulukhaktok
Kendall Island
Anderson River Delta
Tuktoyaktuk
Paulatuk
U.S.A.
Aklavik
Inuvik
INUVIALUIT
Tuktut Nogait
Tetlit Zheh
Tsiigehtchic
GWICH'IN
SAHTU
Fort Good Hope
Colville Lake
65°
65°
Great Bear Lake
Norman Wells
Deline
Tulita
NORTH SLAVE
Thelon
Mackenzie River
Wekweeti
Gameti
TLICHO
Wrigley
Wha Ti
Behchoko
Yellowknife
Lutselk'e
Detah
SOUTH SLAVE
DEH CHO
Great Slave Lake
60°
Nahanni
Fort Simpson
Fort Providence
Mackenzie Bison Sanctuary
Jean Marie River
Fort Resolution
Nahanni Butte
Kakisa
Hay River
Enterprise
Wood Buffalo National Park
Salt River Settlement
Fort Smith
Fort Liard
Trout Lake
135°
130°
125°
120°
115°
110°
105°

Land Claim Regions in the Northwest Territories

Aurora Research Institute

The Aurora Research Institute's mandate is to improve the quality of life for NWT residents by applying scientific, technological and indigenous knowledge to solve northern problems and advance social and economic goals.

ARI is responsible for:

- licensing and coordinating research in accordance with the NWT Scientists Act: this covers all disciplines including the physical, social, biological sciences and traditional knowledge;
- promoting communication between researchers and the people of the communities in which they work;
- promoting public awareness of the importance of science, technology and indigenous knowledge;
- fostering a scientific community within the NWT which recognizes and uses the traditional knowledge of northern aboriginal people;making scientific and indigenous knowledge available to the people of the NWT;
- supporting or conducting research and technological developments which contribute to the social, cultural and economic prosperity of the people of the NWT.

For more information, contact ARI at:

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The Department of Environment & Natural Resources

The Government of the Northwest Territories' Department of Environment and Natural Resources (ENR), has a mandate to promote sustainable development through the management and protection of the quality, diversity and abundance of natural resources and the integrity of the environment.

With respect to permitting for research and monitoring, ENR is responsible for issuing Wildlife Research Permits under the Wildlife Act (Section 24) for all studies on wildlife or wildlife habitat in the Northwest Territories. Wildlife includes all vertebrates, except fish and marine mammals.

For more information, contact ENR at:

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Environment and Natural Resources
Government of the Northwest Territories
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Website: www.nwtwildlife.com/ResearchPermits/

Northwest Territories Environment and Natural Resources

Department of Fisheries and Oceans

The Department of Fisheries and Oceans Canada (DFO) is responsible for developing and implementing policies and programs in support of Canada's scientific, ecological, social and economic interests in oceans and fresh waters. Some Fisheries management responsibilities have been delegated or transferred to other federal agencies (e.g. Parks Canada), provinces/territories and co-management groups under Land Claim agreements.

DFO Fisheries Management is responsible for issuing Commercial, Domestic, Licence to Fish for Scientific Purposes (LFSP), Exploratory, Public Display and Educational licences in the NWT. Subject to Land Claim agreements, a Commercial licence is required to sell or barter fish.

All individuals fishing for scientific purposes or participating in the acts described below are required to obtain a Licence to Fish for Scientific Purposes (LFSP):

- activities involving fishing, catching or attempting to catch fish;
- activities where the potential exists for the incidental capture of fish;
- sampling or possessing fish caught in a subsistence fishery.

For further information about licensing, contact DFO at:

Licensing Officer
Central & Arctic Region
Government of Canada
Fisheries and Oceans Canada
PO Box 1871
Inuvik, NT X0E 0T0
Tel: (867) 777-7500 Fax: (867) 777-7501
email: xca-inuvikpermit@dfo-mpo.gc.ca
Website: http://www.dfo-mpo.gc.ca/index-eng.htm

Prince of Wales Northern Heritage Centre

The Prince of Wales Northern Heritage Centre (PW NHC), a division of the Department of Education, Culture and Employment, Government of the Northwest Territories, is responsible for managing and protecting the archaeological resources of the NWT. Archaeological sites in the NWT, which contain relics from over 7000 years of continuous occupation in the territory, are fragile and non-renewable. They are protected from disturbance by legislation, regulation and policy in the NWT. There are currently about 6000 archaeological sites recorded in the NWT, though this number represents only a fraction of the existing sites, as large areas remain unexplored for archaeological resources. A large part of the work done at the PW NHC involves reviewing land use and development permit applications. On average, 300 permits are reviewed per year, with recommendations being proffered to nine land management authorities.

With respect to permitting for research and monitoring, PWNHC is responsible for issuing NWT Archaeology Research Permits.

For more information, contact the Prince of Wales Northern Heritage Centre at:

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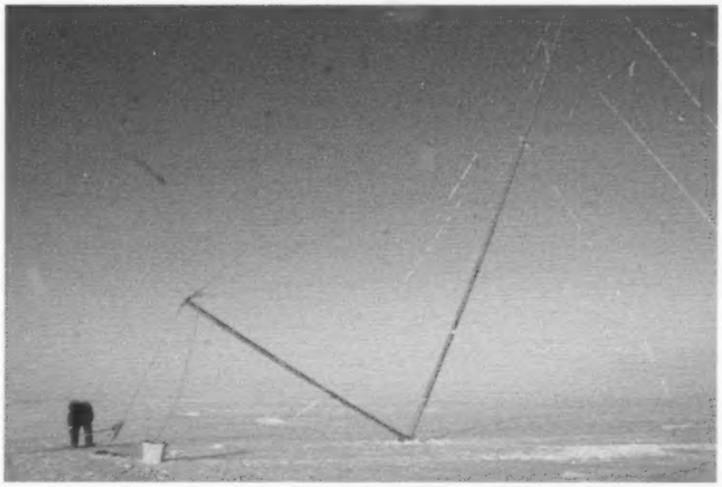
Website: www.pwnh

Northwest Territories Education, Culture and Employment

2011 Licenced Research Projects



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File No: 12 402 842
Region(s): SA

Licence No: 14847
Location: Bosworth Creek; Norman Wells

Bosworth Creek aquatics and fisheries monitoring program Gahcho Kue

The objective of the Bosworth Creek aquatics and fisheries monitoring program was to determine current water and aquatic habitat quality, and to establish baseline conditions for evaluation of future monitoring data. In order to achieve the project objectives, sampling stations within and downstream of the active Imperial Oil Norman Wells lease area were compared to an upstream reference station, located beyond the possible influence of the development. Field monitoring was conducted on August 31 and September 1, 2011.

The 2011 program included the following components:

- Collection and analysis of surface water quality samples from four upstream and three downstream locations;
- Assessment of the benthic invertebrate community at six locations coincident with the surface water quality sampling; and
- Assessment of fish habitat quality at two upstream and two downstream locations.

Please note that fish sampling was not conducted in 2011. Analysis of data collected in 2011, and preparation of a summary report, is currently underway.

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File No: 12 402 861
Region(s): IN,SA,NS

Licence No: 14914
Location: Norman Wells; Yellowknife; Aulavik National Park on North East Banks Island

Ecological structure of northern arthropods: adaptation to a changing environment

Our research team visited three areas in the Northwest Territories: Yellowknife (June 6-21), Norman Wells (June 6-19), and Aulavik National Park on Banks Island (July 6-22). In all three locations we conducted our standardized sampling of insects and spiders at six sites, as well as some opportunistic collection in a variety of both terrestrial and aquatic habitats. Collections in all three locations were highly productive, especially for biting flies, higher flies, spiders, and parasitoid wasps. Team members are currently processing the samples in our labs at McGill University and the University of Toronto.

Specimens in groups of interest are being sorted, dried, pinned, labeled, and identified. Data will be analyzed to test how, and to what degree, the structure of arthropod communities change between boreal, subarctic and arctic ecoclimatic zones, and to assess how northern arthropod communities have adapted to recent (50-60 year) changes to their environment. Cutting-edge molecular genetic techniques will aid species identification and help elucidate longer-term (i.e., phylogeographical) patterns. In addition to our collection-based activities, the research team also participated in public education activities as bug experts at "Bugfest at the Museum" in Yellowknife.

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File No: 12 402 475
Region(s): SA
Licence No: 14890
Location: Nota Creek C-17 well site

Phytoremediation study on the Candadian forest et al. Nota Creek C-17 wellsite
Phytoremediation is a remediation strategy involving the use of plants to remove contaminants. In theory, plants take up the contaminant from the soil, are harvested and then removed from the site. This process is repeated until the impacted soil is remediated to applicable guidelines. Phytoremediation activities on the Nota Creek C-17 well site progressed to full site planting in 2009 and 2010. Remediation results were encouraging enough to support excavating impacted soil still buried on the site and integrating it into the phytoremediation process.

Personnel and equipment were mobilized to the site, approximately 43 km southeast of Norman Wells and 38 km northwest of Tulít'a, in February/March 2011 under frozen ground conditions. Some of the remaining impacted soil that was still buried was excavated and stockpiled. In early July 2011, a portion of the excavated impacted material was incorporated into the phytoremediation process. The soil was spread and conditioned, and the site fertilized and seeded. Plant health and vigor was assessed in mid-August during a monitoring trip. In late September personnel were mobilized to the site to collect plant and soil samples, to harvest the growth from the impacted areas and to remove that growth from the site. Initial laboratory results from the collected samples were encouraging and support continuation of the application of phytoremediation technology to the well site.

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File No: 12 402 858
Region(s): IN
Licence No: 14901
Location: The Baillie Islands and northwestern portions of Cape Bathurst

Population inventory of hairy rockcress (*Braya pilosa*): NWT's rarest species of global importance

Hairy rockcress, a plant first collected by Sir Richardson in the mid-1800s, is known from only one area in the world; Cape Bathurst on the Beaufort Sea coast. Specimens from that site were collected more than 200 years ago, and then thought to be lost until 2004 when the exact location was re-discovered. The objectives of the 2011 field trip were to determine how many populations of this rare plant grow on Cape Bathurst, and to describe and evaluate the threats to its survival. Part of the team arrived by airplane on July 25, set up camp and walked to and along the coast. New locations for this plant were found. The major threat to this rare plant is shoreline erosion. For example, the 2004 site was re-examined and found to be almost all gone due to ground slumping into the sea and salt kills. On August 1, additional team members arrived with a helicopter and a large area of Cape Bathurst was searched for one day. The whole team left the Cape on August 2, 2011.

In all, about 15,000-20,000 plants were observed in 10 locations, some of which are protected from coastal erosion for now. The results of this survey are being used to assess the biological status of the rare plant in reports for the Committee on Endangered Wildlife in Canada and for the NWT Species at Risk Committee.

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File No: 12 402 263
Region(s): NS

Licence No: 14975
Location: The La Martre River, extending from the La Martre River Falls to the confluence with the Marian River

La Martre River fall fisheries program

In 2009, the Tłįchǫ Investment Corporation proceeded with a pre-feasibility investigation of the La Martre River Hydroelectric Project. The project is a 13.2 MW run-of-river power generation facility that proposes to divert 30 m^3/s, or approximately 89% of the mean annual discharge, from a headworks facility on the La Martre River. In order to understand the potential effects of a sudden increase/decrease in flow on fish and fish habitat within the river, Cambria Marshall Côté consultants completed a preliminary assessment in 2011. The results indicated that there is a risk of stranding fish and/or dewatering incubating eggs; however, the study was conducted at a desktop level and no fisheries information was available downstream of the proposed tailrace. It was recommended that a fish and fish habitat study be conducted downstream from the proposed tailrace.

Field work was completed in September 2011 by Cambria Marshall Côté and a local technician from the community of Whatì. The study area was broken into two distinct river reaches: upper (tailrace to 8 km downstream) and lower (8 km to 34 km downstream of tailrace). A total of 42 sample sites were visited within the two reaches, and four habitat types were identified in each.

A total of 159 fish from 9 species -- stickleback, sculpin, arctic grayling, northern pike, sucker spp., lake chub, burbot, emerald shiner, and trout perch – were captured within the upper section. A braided side-channel habitat was found to provide high value habitat to a number of species and potentially critical habitat for arctic grayling. A total of 129 fish from 7 species - stickleback, sculpin, northern pike, sucker spp., lake chub, inconnu, and emerald shiner -- were captured within the lower section. Run/glide and deep pool habitats in this section were documented to provide excellent rearing potential, and based on the depth and velocity characteristics, likely provide excellent overwintering potential.

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File No: 12 402 780 **Licence No:** 14841
Region(s): SA **Location:** Bosworth Creek

Bosworth Creek monitoring project
This Bosworth Creek Monitoring Project (BCMP) is a high resolution, long-term study of a 125 square kilometer watershed at Norman Wells, NWT. The project was initiated after the Sahtu Renewable Resources Board received a request from local residents for information on fish stocks in Bosworth Creek, following the removal of a weir in 2005 by Imperil Oil Resources. The project has focused on studying benthic insects and creating a chemical inventory over the past three years. The benthic work will be completed within one year and will compare Bosworth insects with three other nearby streams. The water quality analysis will be completed by September 2011. This information will be invaluable for local Renewable Resources Council stewardship. The project will continue to monitor potential or existing impacts by climate change and industry.

The BCMP has become a permanent component of Mackenzie Mountain School's high school curriculum program through the NWT Experiential Science Program. The BCMP will continue to provide professional development for local youth through associations with academic and industrial institutions.

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File No: 12 402 780 **Licence No:** 14873
Region(s): SA **Location:** Lac St. Therese; Kelly Lake; Lennie Lake; Stewart Lake; Tate Lake; Hodgson Lake

Baseline mercury levels in predatory fish in the Sahtu Settlement Area
No research was conducted under this licence in 2011.

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File No: 12 404 771 **Licence No:** 14938

Region(s): SA

Location: Along the proposed Highway Route within the K'ahsho Got'ine District from Gibson Gap to the Thunder River

Mackenzie Valley Highway project description report

Environmental field work was conducted along the proposed K'ahsho Got'ine Highway (KGH). This field work was undertaken by a fisheries biologist and ecologist with AMEC Environment and Infrastructure. The proposed highway would upgrade the winter road from Norman Wells to Fort Good Hope into a year round road and construct a new road northwards to the Gwich'in Settlement Area boundary. The goal of this field work was to verify the environmental information that was available for potential fish and wildlife habitat, as well as plant communities along the proposed highway.

The field work was conducted from July 12th to 16th, 2011. The field work was planned to use a helicopter to assess watercourse crossings with potential fish habitat and portions of the route with limited environmental information. However, due to issues with the helicopter, part of the proposed highway near Fort Good Hope was accessed by hiking and by boat. Notes and photographs were taken on the presence or absence of fish habitat and plant communities at each watercourse crossing. In addition, notes were made on the suitability of wildlife habitat.

The final project description report was delivered to the K'ahsho Development Foundation in January 2012.

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File No: 12 402 867
Region(s): SS

Licence No: 14970
Location: The mouth of the Slave River Delta near Fort Resolution; the Slave River within the municipal boundaries of Fort Smith

Fish health study in the Slave River and the Slave River Delta

The aim of this study is to investigate the contamination of the Athabasca/Slave river system with chemicals potentially derived from oilsands activities in northern Alberta. Contamination effects on fish health, and the quality of those fish as food, were examined. The potential for contaminants effects on the health of fishes in the Athabasca River was identified previously from measures of chemicals in water and snowmelt, and there have been reports in the press of the occurrence of fish with lesions. Furthermore, observations from local harvesters suggest that similar health impacts may be happening to fish from the Slave River system, which is immediately downstream of the Athabasca system.

Potential impacts on fisheries were assessed by collecting four species of fishes from several locations in the Athabasca/Slave River system. Samples were collected at Ft. McMurray AB (upstream of oilsands activities), Ft. McKay AB (immediately downstream of oilsands activities), Ft. Chipewyan AB (where the Athabasca River enters Lake Athabasca), Ft. Smith NWT (on the Slave River downstream of Lake Athabasca) and Ft. Resolution NWT (where the Slave River empties into Great Slave Lake). Fish were collected in collaboration with local harvesters and other community members, aboriginal organizations, provincial or territorial authorities and Federal agencies as appropriate.

The health assessment did not indicate any major observable differences in fish health between sites, however this data is still being compiled for statistical analysis, which cannot be conducted until all sampling is complete in the spring of 2012. Samples have been submitted to laboratories for analysis of metal and organic chemical content. While preliminary results for metals have been provided they have not yet been subjected to final quality assurance/quality control (QA/QC) assessment, and so cannot be released.

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File No: 12 402 664 **Licence No:** 14960
Region(s): IN **Location:** Along the proposed Tuktoyaktuk to Inuvik highway

Archaeological and fish habitat assessment for the Tuktoyaktuk to Inuvik highway
IMG-Golder Corporation completed an archaeological and fish habitat assessment on behalf of the Government of the Northwest Territories Department of Transportation, as required for the proposed Inuvik to Tuktoyaktuk highway and two potential realignments (Alternative 1 and Alternative 3) in the Inuvialuit Settlement Region.

The objectives of the archaeological assessment were to identify, record and assess cultural heritage resources that might be impacted by the proposed highway project, and to devise mitigation strategies should any be found in conflict with the proposed highway. A field investigation was completed in September 2011 over a six day period, along the planned highway right-of-way and at several proposed borrow source locations. No artifacts were found and no new sites were recorded.

The objective of the fish habitat assessment was to assess the 36 watercourse crossing locations of the proposed highway and potential realignments that remained following the 2009 and 2010 surveys. Site assessments on the proposed watercourse crossings were conducted in September 2011. A total of 11 watercourses were assessed as being ephemeral with no defined channel, 10 were classified as intermittent, and 15 were classified as perennial with a defined channel. One crossing could not be located.

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File No: 12 404 733 **Licence No:** 14962

Region(s): NS
Location: The Kennady Lake watershed and adjacent watershed areas

De Beers - Gahcho Kué ecological risk assessment program

Collections of soil, berries, and vegetation were completed in Sept 2011 at the Gahcho Kué project. Up to 10 samples each of lichen, berries (cranberries), leaves (dwarf birch), and grass were collected among the 23 soil sample sites. Samples were sent to a lab to measure metal and polycyclic aromatic hydrocarbon levels. Results will be used to refine the environmental assessment for the project.

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File No: 12 404 758
Licence No: 14929
Region(s): IN
Location: Peel Plateau; Aklavik Area; Delta Uplands; Outer Delta; Aklavik / Western Delta

Vegetation monitoring and science training in the Mackenzie Delta region

From 2010-2012, AANDC scientists have been working with researchers at the University of Victoria, and Hunters and Trappers Committees (HTCs) in the Mackenzie Delta, to develop a vegetation monitoring protocol that can be implemented by a range of users. The long-term goal of this program is to establish and maintain a network of sites to characterize regional environmental variability, and serve as a baseline against which to measure changes resulting from the cumulative impacts of multiple natural and anthropogenic disturbances. At all sites in the network, we measure vegetation structure, plant community composition, tree density, the productivity of edible berries, active layer depth, and near surface ground temperatures. At core sites we also maintain meteorological stations, frost tubes, and deep ground temperature cables.

Since 2010, we have established 35 community-based monitoring sites in 6 terrain types. Statistical power simulations, using data from 2010-2012, also show that the protocol is capable of detecting small changes in vegetation structure. Through a partnership with Environment Canada and the Canadian Forest Service, we are working to identify areas of overlap among this and other programs and, where possible, develop common monitoring techniques. By selecting monitoring sites that are regionally representative, and including disturbances that communities have identified as priorities, this monitoring program also provides a platform for directed research and hypotheses-driven investigations, that will contribute to local decision making.

We are in the final stages of production of a user-friendly protocol guidebook. We anticipate completion and first printing in advance of the 2013 field season.

Baseline data on vegetation, active layer, and snow is being added to the NWT Discovery Portal on an ongoing basis.

In February 2012, a presentation describing project outcomes was given to our community partners in Inuvik, as well as several project presentations were also delivered in Yellowknife.

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File No: 12 402 685
Region(s): NS,SS

Licence No: 14945
Location: Within Avalon's Thor Lake Property, approximately 100 km southeast of Yellowknife; Redemption Lake, just northeast of Thor Lake

2011 baseline studies for Avalon Rare Metals Inc. proposed Thor Lake rare earth element project - aquatics and fisheries

In 2011, Deton'Cho Stantec conducted three field programs for the aquatics component of this project. This included: water and plankton (phytoplankton and zooplankton) sampling in June; water, sediment, plankton and benthic invertebrate sampling in September; and water sampling in October. Sampling was carried out at 8 lake stations.

Results from the 2009-2011 field programs indicate neutral to basic water and very low nutrient levels at all stations. There were large fluctuations in some general and metal parameters, primarily during winter in small, shallow lakes that developed highly reducing, anoxic conditions under ice. Sediment characteristics varied, though generally lake sediment had high phosphorus, nitrogen and organic carbon content; metal levels in sediment ranged from less than detection to higher than the guidelines set by the Canadian Council of Ministers of the Environment. Chlorophyll levels varied among lakes and seasons, and most of the lakes were oligotrophic. From 2009-2011, phytoplankton and zooplankton abundance, richness and diversity varied between lakes and years. Predominant phytoplankton species included filamentous and coccoid blue-green algae, colonial yellow-brown algae and small cryptoflagellates. One rotifer species was the predominant zooplankton taxa in most lakes from 2009-2011. Similarly, benthic invertebrate abundance, richness, diversity and evenness varied between lakes and years. One dipteran family (Chironomidae), one crustacean order (Amphipoda) and one clam family (Sphaeriidae) were found in most lakes.

The fisheries component of the 2011 Thor Lake baseline study included a fish sampling program at five lakes (Ring, Buck, Drizzle, Ball and Murky). A total of three juvenile northern pike were captured; two from Drizzle Lake and one from Murky Lake. No fish were caught in Ring, Ball or Buck Lakes. These results support the conclusions from field studies in 2009-2010: Drizzle and Murky Lakes are fish-bearing while Ring, Ball and Buck Lakes are non-fish bearing.

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File No: 12 402 856
Region(s): SA

Licence No: 14887
Location: The Great Bear River from Great Bear Lake to the Mackenzie River, near Délı̨nę and Tulít'a

Great Bear River environmental and traditional knowledge baseline program
A field program was conducted in August 2011 with participation from both Tulít'a and Délı̨nę. Five sites were identified on the Great Bear River, and data were collected on the channel structure, sediment, water chemistry, fish community and habitat, benthic invertebrates, and other environmental disciplines. Data is still being analyzed, but the following points provide a brief summary of field program results:

- Fourteen species of fish were identified.
- The average age of the fish caught using gillnets was 8 years; the oldest fish caught was a 15 year old walleye.
- The mercury level in the water at all sites was very low.
- The creeks flowing into the Great Bear River have different water chemistry.

The traditional knowledge (TK) portion of this study is underway at this time, and residents of both Tulít'a and Délı̨nę are involved. The focus of the TK portion of the study is to better understand conditions of the river, including how the river is used, freeze/thaw patterns, locations of important cultural sites and key hunting and fishing areas. TK information will be documented by conducting workshops and interviews with elders, renewable resources councils, land users and residents from Tulít'a and Délı̨nę.

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File No: 12 402 859
Region(s): GW

Licence No: 14902
Location: Richardson Mountains near Husky Channel; area south of Inuvik to Fort McPherson

Reassessment of the *Polygonia faunus* complex
The primary objective of this project was to collect a species of butterfly (*Polygonia faunus arcticus*) from sites in the Yukon and Northwest Territories, with a particular emphasis placed on obtaining specimens from Black Mountain in the Richardson Mountains, the type locality of this subspecies. These specimens supported a taxonomic assessment of the *Polygonia faunus arcticus*. Genetic analysis indicates that subspecies *arcticus* is synonymous with subspecies *faunus*, while subspecies *hylas* contains two additional as yet undescribed subspecies, and at least two independent expansion phases of *Polygonia faunus* into eastern North America have occurred. The results of this research have been submitted to BMC Evolutionary Biology, a peer-reviewed scientific journal of entymology, and a trip report was published in the News of the Lepidopterist Society. A secondary objective of this study was to assess other butterfly species from this region. Initial evaluation of *Polygonia gracilis* from the Richardson Mountains demonstrates that the dorsal surface of these individuals resembles that of the western subspecies *Polygonia gracilis zephyrus*, whereas the ventral surface of these individuals resembles that of the eastern subspecies *Polygonia gracilis gracilis*. Thus, the Richardson Mountains are a blend area for *Polygonia gracilis*.

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File No: 12 402 857
Region(s): DC

Licence No: 14875
Location: Fort Simpson - Cli Lake, Little Doctor, Sibbeston Lake, Tsesto lake; Wrigley - Blackwater Lake, Fish Lake; Jean Marie River - McGill Lake, Deep Lake; Trout Lake - Trout Lake

Updating data on mercury levels in food fish species in lakes used by Dehcho communities
In 2011, the Deh Cho Aboriginal Aquatic Resources and Ocean Management (AAROM) program carried out the first year of this multiyear project. Work was done on five lakes with the assistance of local community monitors, who were critical to completing work in the field. Fish were collected and sampled, and water quality samples were taken.

In the Jean Marie River First Nation area, fish and data were collected from Deep, McGill and Ekali Lakes. In total 5 yellow walleye, 4 northern pike, 3 burbot and one lake whitefish were caught in 13 sets at Deep Lake; 33 yellow walleye, 19 northern pike, 12 white sucker and 3 lake whitefish in 5 sets at McGill Lake; and 18 yellow walleye, 16 northern pike and 35 lake whitefish in 6 sets at Ekali Lake.

In the Pehdzeh Ki First Nation (Wrigley) area, fish and data were collected from Fish Lake. In total 5 yellow walleye, 20 northern pike, 10 lake trout, 7 burbot and 25 lake whitefish were caught in 20 sets. Twenty-five lake trout were also collected from Trout Lake by residents of Sambaa K'e, and fish were sampled in Hay River.

All of the fish collected during this project were biologically sampled in the field for fork length, total length, round weight, ageing structures, stomach contents, sex/maturity and gonad weight. If it was possible, fish were distributed to each local community afterwards.

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File No: 12 402 851
Region(s): GW

Licence No: 14952
Location: Stony Creek (NWT); Vittrekwa River (Yukon)

Dolly Varden char assessment in the Peel Plateau
This project had two parts. The first was to re-assess the population size of the Vittrekwa River Dolly Varden char stock. The second was to determine if Dolly Varden char exist in the Stony Creek watershed near Fort McPherson.

The project was carried out in August 2011. A team of three flew to the upper Vittrekwa River by helicopter and installed a fish weir on the spawning creek used by Vittrekwa River char. The weir was in place for 19 days and a total of 44 mature adult char were captured. Another 19 mature adult char were captured by angling. All char were sampled for length and weight, while only 50 had a small piece of fin removed for genetic analysis. It is important to note that only adult, sexually mature char were sampled. The actual population size of this stock is larger than this number (63 char sampled) because immature char were not counted in this assessment, as they typically do not migrate to the spawning tributary. Also, during the early period after the weir was installed, it was not operating efficiently and missed capturing a large number of mature male char. Because of this, the number of char counted through the weir can only indicate an absolute minimum population size. Visual counts of the spawning area estimated approximately 140 mature adult char. In addition to fish sampling, 9 CABIN (Canadian Aquatic Biomonitoring Network) reference sites were established for comparison with streams affected by permafrost slumping in the lower Vittrekwa and Stony watersheds.

Sampling in the Stony Creek watershed was not completed because of high water and unfavorable conditions. One burbot was accidentally captured in an invertebrate kick net and was released. Juvenile grayling were observed in off-channel habitat but were not sampled.

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File No: 12 402 848
Region(s): NS

Licence No: 14849
Location: Yellowknife River between Prosperous Lake and Bluefish Lake

NTPC Bluefish Hydro repairs
The objective of this study was to describe the aquatic environment in the Yellowknife River between Prosperous Lake and Bluefish Lake. In particular, efforts were made to document current fish use of the existing dam. The results will be used to determine the most suitable means of fish habitat compensation, and to guide mitigation strategies during construction of the new dam for Bluefish Hydro.

In October 2011, a four-day fisheries assessment was completed in Bluefish Lake. Gillnets and Gee minnow traps were deployed, both near the existing dam and at the inflow to Bluefish Lake. Most fish were released live, although some were sacrificed to document age, sex, and reproductive status. Additional bathymetry information was also collected in the vicinity of the existing dam, and lake shore substrate and water quality was documented in Bluefish Lake.

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Region(s): GW,SS

Licence No: 14939
Location: Adjacent to and along Highway #5, between the boundary of Wood Buffalo National Park west of Fort Smith and Angus Tower; Along Highway #5, between the Park boundary

west of Fort Smith and the intersection with the road leading to Thebacha Camp; near Inuvik

Structure, carbon dynamics, and silvichronology of boreal forests
Forest landscape may be going through changes in growth under a warming climate. We are trying to evaluate that thought (or hypothesis) by measuring forest growth at present, and by estimating its history during the past 100 years. Tree rings have been extensively used. We have also measured the movement of carbon in forest ecosystems, including growth of fine roots in the soil. Previous research we did in the Northwest Territories indicated that the proportion of growth in fine roots to the whole amount of forest growth is large, so root growth needs to be studied seriously. We continued to collect data in small (several square kilometers) forest plots near Inuvik and in about a dozen forests near Fort Smith this year to estimate forest growth. Remote sensing was also used.

We have almost finished measuring tree rings from several hundred stem samples we collected last year. We will use this data to calculate forest growth history. We will continue to study the forest plots next year to improve the accuracy of our reconstructed forest history. Thanks to a new development this year, a research partnership between Japan and the USA for investigating arctic environments, we are now considering extending our experience in the Canadian north to a study of the entire arctic environment by starting similar projects in Scandinavia, and by integrating old and new results of our research activities.

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File No: 12 402 766
Region(s): NS

Licence No: 14850
Location: Waterbodies located within the EKATI claim block

EKATI aquatic monitoring program, 2009-2013
In 2011, seven monitoring projects were ongoing in the lakes and streams of the Koala, King-Cujo and Pigeon watersheds, where EKATI mine infrastructure are located.

The objectives of the aquatic effects monitoring program (AEMP) and the Fay Lake monitoring program were to assess the current conditions in the lakes and streams of the Koala, King-Cujo and Pigeon watersheds, in order to determine whether there have been any mine effects. The objective of the surveillance network monitoring program was to confirm EKATI's compliance with its water licenses. The assessments incorporate some or all of the following: meteorology, hydrology, water quality and physical limnology, sediment quality, phytoplankton, zooplankton, benthos and fish data. Data analyses for 2011 are currently being completed. A detailed review of the AEMP plan for 2010-2012 was submitted to the Wek'eezhii Land and Water Board in 2011. Fish populations in the Panda diversion were monitored for the 13th consecutive year. A compilation and analysis of this work is also in progress. Assessment of fish habitat created in Nero-Nema Stream was ongoing in 2011. The nitrate in situ treatment study is a mitigation strategy developed and implemented in 2010 to reduce nitrate concentrations in the Long Lake containment facility (LLCF). In 2011, the study continued to closely monitor the physical, chemical and biological environment in Cell D and Cell E of the LLCF, with minor modifications to fertilizer timing additions. Air quality was monitored using high volume air sampling, continuous ambient monitors and dust fall measurements as a part of the air quality monitoring program.

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File No: 12 402 724
Region(s): NS

Licence No: 14891
Location: Seven lakes, and their six outlet streams, draining into Lac de Gras

Improving habitat connectivity to enhance productive capacity of arctic freshwater ecosystems
The Diavik Diamond Mine, located on Lac de Gras in the Northwest Territories, has proposed a habitat compensation project for nearby lake and stream systems. Headwater lake outlet streams at two sites will be modified to improve fish passage, and thus ecological "connectivity" among these headwater lakes and with Lac de Gras. One set of habitat manipulations occurred in fall 2011, while the second habitat project will occur during summer 2012.

Sampling during the 2011 summer field season (Year 3 of the "before" period) was conducted according to plan. Combined with the two lake-stream ecosystems designated for habitat compensation, several other lake-stream reference systems were studied to provide information on the spatial variability of aquatic ecosystems in the barren lands, and to incorporate natural temporal patterns in these ecosystems. We sampled each lake and stream for hydrology, water quality, habitat characteristics, primary producers, invertebrates, and fish to establish pre-manipulation baseline conditions for these ecosystems.

Electrofishing and hoop netting in streams revealed very low abundances of slimy sculpin and juvenile burbot. We collected Surber and drift samples of macroinvertebrates, in both riffle and pool habitats, from seven streams in the Lac de Gras watershed (4 slated for modification, 3 controls) during the ice-free season. Post-winter recolonization of streams by macroinvertebrates was measured by placing different colonization boxes, open to only one type of colonization (upstream, downstream, aerial, and vertical), in each stream. Samples are currently being analyzed .

Lake fish assemblages were surveyed by gill netting, angling, and electrofishing. Fish communities and species abundances vary among lakes, but consist mainly of arctic grayling, lake trout, round whitefish, burbot, longnose sucker, and slimy sculpin. During this "before" period, we are comparing the ecology (diet composition, condition, growth) of lake trout in lakes with other fishes, to that of lake trout in lakes without other fishes.

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File No: 12 402 842 **Licence No:** 14853
Region(s): IN, GW **Location:** Inuvik

Northern native seed development field trials
The objective of this project is to continue assessing the performance of native plants which were seeded and transplanted into field plots in 2006 and 2007. Data regarding winter survival, seedling emergence, and overall plant vigor and productivity will be collected in order to assess each species' and collection's suitability for use in land reclamation in the NWT. The results of this study will help to determine which plant species are best suited for restoring disturbed sites to their natural condition in different habitats across the NWT.

This year data was recorded at all three sites. As in previous years, plants which had been transplanted had higher survival than those that were direct seeded. Survival was also higher at the gravel and clay sites than at the peat site. Data analysis is ongoing, and results will be made available at www.nwtresearch.com.

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File No: 12 402 864 **Licence No:** 14958
Region(s): DC,SS **Location:** The sites of six recent fires that occured south of Yellowknife since 2004

Effects of wildfire on biomass combustion in boreal peatlands and forests
Study plots were established in several recent fire scars south of Yellowknife. Data were collected to estimate the depth of burning of fuels on the forest floor (moss and peat). These data will be used to explore ecosystem type and weather as controls on burn severity.

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File No: 12 402 860 **Licence No:** 14903
Region(s): NS,SS **Location:** Daring Lake; ponds, lakes, and creeks in the area of Fort Smith

A phylogenetic and phylogeographic study of predaceous diving beetles in the Nearctic with a focus on the tribe Agabini (Coleoptera, Dytiscidae, Colymbetinae)
The main purpose of this project is to look for information about how water beetles respond to a changing environment, including: how have they re-colonized northern Canada and Alaska after the retreat of glaciers at the end of the last ice age? Another goal is to examine where different types of beetles are found in the north, and to see if these beetles are expanding their ranges northward.

During the summer of 2011 (from July to early August), beetles were collected within 5 km of Daring Lake. To date, the beetles have not been fully identified; however, so far there are between 5 and 7 species that, in comparison to where they were found 30-40 years ago, appear to have shifted their ranges to the north. This information may be important because it tells us how animals in the north may be responding to a changing environment. These, and future results, will be presented at scientific conferences and in scientific journals. They will also be provided to the GNWT, to be placed in the library so the public can access them.

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File No: 12 402 865 **Licence No:** 14961
Region(s): DC **Location:** Prairie Creek

Exfiltration fence habitat assessment
A fisheries field assessment was conducted on August 10 and 11, 2011. The objective of the study was to assess fish utilization of a section of Prairie Creek that will contain the proposed mine effluent exfiltration trench (diffuser) and effluent mixing (dilution) zone. The study area consisted of a 100 m long zone of the creek.

Electrofishing was conducted along both banks of the 100 m zone. Caught fish were identified, weighed, and measured for length. Other habitat assessment work included an assessment of substrate, flow rate, and stream morphology along five transects distributed evenly within the 100 m assessment reach. Slimy sculpin (*Cottus cognatus*) were relatively abundant (23 were caught), and a variety of life stage and sizes/weights were noted, indicating that the proposed effluent mixing zone represents potential spawning and rearing habitat for slimy sculpin.

A single bull trout (*Salvelinus confluentus*) was captured in the channel margin of the creek in shallow, slower moving water. Given the lack of instream cover or rearing habitat available at the point of capture, it is likely that this individual trout was utilizing these slower flows as an opportunity to rest during a migration past the effluent site.

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File No: 12 402 843 **Licence No:** 14846
Region(s): NS **Location:** Diavik Diamond Mines Inc. - Lac de Gras mine site

Waste rock studies at a diamond mine site
The objective of this research was to investigate the processes related to water quality and quantity draining from experimental waste rock piles that are located in areas of continuous permafrost. Waste rock piles are mounds of rock removed from open pit and underground mines. The quality of water draining from a waste rock pile is determined by the combined effects of oxygen transport in the air, biogeochemical processes that control mineral weathering rates, the release of heat and dissolved constituents due to sulfide mineral oxidation, and hydrologic processes that control unsaturated water flow. The transport of dissolved constituents is further affected by the formation and subsequent dissolution of secondary minerals.

Three instrumented experimental waste rock piles were constructed from 2004 to early 2007 at the Diavik diamond mine.
In 2010, three 40 m deep boreholes were drilled into the operational waste dump and a series of instruments similar to those in the test piles were installed. In 2011, two additional 40 m boreholes and one 80 m borehole were installed and instrumented with similar instruments. Data from these instruments will be compared to data from the test piles to evaluate differences in measurement scale. The study is undertaken entirely as a graduate research program through the University of Waterloo, University of British Columbia, and University of Alberta. At least one presentation on the Diavik test piles project will be presented at the Geoscience Forum in November, 2011 in Yellowknife.

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File No: 12 402 681 **Licence No:** 14950
Region(s): SS **Location:** Great Slave Lake: West Basin- near Fort Resolution; and West Basin- near Hay River

Spatial and long-term trends in persistent organic contaminants and metals in lake trout and burbot from the Northwest Territories
This is an ongoing study under the Northern Contaminants Program (NCP); some support was provided by the Cumulative Impacts Monitoring Program. We are investigating whether contaminant levels are changing in Great Slave Lake fish, which we have been studying since the early 1990s. Twenty lake trout from Hay River, 20 pike and 20 burbot from Fort Resolution, and 20 lake trout and 20 burbot from Łutsel

K'e were shipped, frozen and whole, by community members to a lab in Saskatoon. In the lab, length, weight, and age were determined and samples were submitted for metals (including mercury) and persistent organic contaminant analyses. Pike and Łutsel K'e burbot were analyzed only for mercury. Mercury has been showing an increasing trend, although levels remain below the 0.5 ppm guideline. Organic contaminant concentrations have not been increasing; some such as HCH and DDT have decreased in concentration due to their decreased usage. The results of our 2011 findings will be presented in a 2011 NCP report, with those findings shared with our community partners.

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File No: 12 402 868
Region(s): IN
Licence No: 14974
Location: Inuvik; Tuktoyaktuk; Yaya Lake; Noell Lake; Big Lake; Husky Lakes system; 16 lakes along the 177 road; 4 lakes along the Tuk-Inuvik road corridor

Evaluation of hydro-climatic drivers of contaminant transfer in aquatic food webs in the Husky Lakes Watershed (Inuvialuit Settlement Region, NWT)

This fall field campaign was a multi-purpose trip that included some helicopter-supported work, land-based work, and more outreach/consultation. The timing for the late fall/winter work was suggested to us by the Tuktoyaktuk Hunters' and Trappers' Committee (Tuk HTC) and during the review by the Regional Contaminants Committee in the proposal stage. We were asked to come conduct sampling of fish and other parameters when fishers set fishing nets under the ice, thereby limiting helicopter use and our scientific fishing efforts in this ecologically and culturally sensitive ecosystem. Prior to arranging flights to Inuvik, we communicated with the Aurora Research Institute (ARI) in Inuvik and the Tuk HTC to ensure the ice on the lakes was safe for travel. We spent 3 weeks in the Inuvialuit Settlement Region, split between Inuvik and Tuktoyaktuk; we met with local partners (ARI, Fisheries Joint Management Committee, Fisheries and Oceans Canada, Tuk HTC) and the public in Tuktoyaktuk to discuss project details and future directions. We went to all study lakes to develop the methods related to sample collection for two graduate projects (at U Victoria and U Manitoba). The field crew at all sites consisted of three people, with 2-4 local people helping in Tuktoyaktuk. We used Spot devices to map our field trips via GPS Satellite tracking.

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File No: 12 402 862
Region(s): SA
Licence No: 12940
Location: Along the south shore of the Great Bear River, from the source of the river on Great Bear Lake to Tulít'a

Great Bear River site assessments

No research was conducted under this licence in 2011.

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File No: 12 402 664
Region(s): IN

Licence No: 14953
Location: The abandoned Panarctic Satellite F-68 well site, located at Satellite Bay on the north-western coast of Prince Patrick Island

Detailed site description, remediation feasibility and risk assessment of the Panarctic Satellite F-68 Wellsite, Satellite Bay, Prince Patrick Island, NWT

Talisman Energy Inc. conducted a supplemental Phase II Environmental Site Assessment (ESA) program at the abandoned Panarctic Satellite F-68 wellsite area at Satellite Bay on Prince Patrick Island, Northwest Territories . Panarctic Satellite F-68 was a dry exploratory petroleum well drilled in the 1970s.

In 2010, several Areas of Potential Environmental Concern were identified around the wellsite. These included the well site area itself, a small pond containing old steel fuel drums, a landfill area, surficial debris, surface stains, potential buried (likely detonated) explosives, and an area of suspected buried debris adjacent to the landfill.

During the 2011 program, soil and water sampling was conducted to delineate contaminated areas that were identified during the 2010 program. The debris that had been consolidated in 2010 remained as it was left in 2010.

The supplemental Phase II ESA included a geophysical survey covering areas not included in 2010, testing of surface water from the creeks/rivers near the Site, and collection of groundwater and soil samples. Samples were submitted to an accredited laboratory for analysis and compared to applicable territorial and federal guideline criteria.

Exceedances for metals and petroleum hydrocarbons were identified in both 2010 and 2011. Delineation of known contamination was conducted in 2011. Information was collected to define the extents of contaminated soil and groundwater as well as waste materials. Some geotechnical data was collected to support the potential design and construction of a landfill on-site. An assessment of the airstrip was also conducted to determine what aircraft could safely land/take off, as well as what maintenance would be required to support larger aircraft.

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File No: 12 402 863
Region(s): SS

Licence No: 14954
Location: Nagel Channel Boat Landing, Fort Resolution; Fort Smith Boat Launch

Multi-scale environmental health implications of the Athabasca oil sands for Aboriginal communities in Alberta and Northwest Territories
From June 4-20 2012, three members of the University of Manitoba's Environmental Conservation Laboratory conducted field research contributing to this project. During this period we conducted video interviews with community members in Fort Chipewyan, Alberta and Fort Smith and Fort Resolution, Northwest Territories, about environmental change and community concerns about contamination arising from industrial activities affecting the Slave River and Peace Athabasca river deltas.

We shared community newsletters created to publicize the work we had completed between June 2011 and spring 2012 with community collaborators. These newsletters are an attempt to create a communication network for communities to share their knowledge and concerns with each other, and for the scientific community to communicate their research approaches and results. Two thousand copies of these newsletters have been printed for distribution to First Nation and Métis Nation research partners in Fort Chipewyan, Fort Smith and Fort Resolution.

We anticipate return visits to Fort Chipewyan in fall 2012 and production of a second newsletter for distribution to all community partners in spring of 2013.

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File No: 12 402 778
Region(s): NS, SS

Licence No: 14872
Location: Blanchet Island Mine ; Outpost Island Mine ; Copper Pass Mine ; DeStaffany Mine

Great Slave Lake area mines: site assessment and remediation planning
No research was conducted under this licence in 2011.

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Region(s): SS

Licence No: 14966
Location: Slave River Delta

Sediment core sampling to assess contaminant deposition to the Slave River Delta (NWT) over time

The perceived negative downstream effects of oil sands development is a major environmental issue of international concern. In the Slave River Delta, a key unknown is whether industrial activity is enhancing the delivery of natural sources of oil sands-derived contaminants. In this study, sediment cores were taken from a flood-dominated lake in the Slave River Delta. The historical record is necessary for determining baseline concentrations of polycyclic aromatic compounds (PACs).

Using a gravity corer, lake sediment cores were collected in September 2011 from a small (~1.2 km^2), shallow (maximum depth ~1.5 m) flood-dominated lake in the active Slave River Delta . Sediments in this lake contain a record of spring break-up flooding for at least the past century . Sediment cores were sectioned into 1 -cm intervals, placed in sample bags and shipped to the University of Waterloo. Samples are currently being analyzed for 1) radiometric isotope (137Cs, 210Pb) concentration to develop the sediment core chronology, 2) loss-on-ignition to characterize physical properties of the sediment core, 3) organic carbon and nitrogen elemental and isotopic composition to reconstruct past hydrological conditions, and 4) PACs to examine their depositional patterns and trends over time.

Research is being conducted as an initiative of the Slave River and Delta Partnership. Field work in September 2011 was conducted with the assistance of a community member. Also, while conducting field work, presentations were made to classes of school children at the Fort Resolution Deninu School and an open-house was held in Fort Resolution to inform the community of the project.

Analyses are in progress but results are expected to contribute new knowledge of how and if PAC deposition in the Slave River Delta has changed over time. Research will contribute to addressing concerns of local residents over the perceived impacts of upstream oil sands development, and will help prioritize future research and monitoring needs.

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File No: 12 406 054
Region(s): NS
Licence No: 14949
Location: Along the length of the Tibbitt to Contwoyto Winter Road

Paleoclimatological assessment of the central Northwest Territories: implications for the long-term viability of the Tibbitt to Contwoyto winter ice road

In support of our three-year multi-disciplinary research project, 80 sediment/water interface samples from 43 lakes along the route of the Tibbitt to Contwoyto Winter Road have thus far been analyzed for water property data, substrate characteristics , nutrient loading, water geochemistry, isotopes and environmentally available metals. This data is being used to develop training sets and transfer functions based on micropaleontological proxies; the camoebians, diatoms and chironomids. Twenty-one Glew cores and 16 freeze cores have also been collected from these lakes. Use of a freeze core microtome has permitted subsampling of freeze cores to mm-resolution (2-5 years). Preliminary time series analyses results indicate that throughout the late Holocene there has been considerable climate variability, with winter and summer signals often becoming decoupled. The Pacific Decadal Oscillation and North Atlantic Oscillation have contributed to step-wise temperature changes as these phenomena vary between positive and negative phases. There is also a correspondence between solar cycles and seasonal climate variability, with solar cycle peaks corresponding to cooler summers and warmer winters, and troughs corresponding to warmer summers and colder winters.

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File No: 12 406 058
Region(s): NS
Licence No: 14910
Location: Thor Lake near the Avalon Rare Metals Inc. development

Wind energy monitoring at Thor Lake 2010-2011

In 2009/10, one year of wind data was analyzed from a 50 m meteorological station installed near Thor Lake on a ridge overlooking the Hearne Channel. The projected long-term average wind speed at 48 m above the ground is estimated to be 5.7 m/s. At 80 m above the ground, the long-term wind speed is estimated to be 6.5 m/s. Data collection continued through 2010/11 with similar results, though winter wind speed measurements were not recorded due to mechanical issues. This will be resolved by extending the monitoring stage of the project. All reports related to this project are available at www.nwtresearch.com

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File No: 12 406 058
Region(s): NS
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Location: Wekweètì

Wind energy monitoring in Wekweètì: 2010-2012

Two wind monitoring towers were installed in Wekweètì in October, 2010, following a pre-feasibility study and community consultation. The first tower installed is 34 meters tall, and the second is 10 meters tall. Each tower is equipped with anemometers to measure wind speed, a wind vane for wind direction, a meteorological station to record weather, and a data logger to store the information. The 34 m tower is now monitoring wind speed and direction for potential wind energy to serve the entire community, and the 10 m tower collects data for potential wind energy to directly serve the new complex.

After the towers were installed, a local resident was hired and trained to be the wind monitor. His duties include monthly site visits, the collection of data, and maintenance of the towers. These towers will collect data for up to two years, after which the data will be analyzed and a feasibility report written. Recommendations will be presented to the community for review and discussion.

In 2011, data collection was ongoing. The project technician returned to Wekweètì to check the towers and provide additional training. For more information on wind energy project activities, please visit our website at www.nwtresearch.com

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File No: 12 404 720
Region(s): DC
Licence No: 14963
Location: Jean Marie River; Fort Providence

Solar irradiance monitoring in Jean Marie River and Fort Providence

The majority of Canada's northern communities are dependent on fossil fuels for electricity generation. Due to their remoteness, the cost of transporting diesel fuel to these communities is a large financial burden on the territory's government and utility companies. Renewable energy, particularly in the north, offers many potential benefits to northern communities. Using wind or solar power in place of diesel can help to reduce particulate emissions and the greenhouse gas emissions which contribute to climate change.

Solar energy is of particular interest in the southern parts of the NWT, though little irradiance data has been collected in the territory to date. The objective of this project, therefore, is to measure solar irradiance levels in Jean Marie River and Ft. Providence, in order to support pre-feasibility studies on the use of solar energy in those communities.

In August, 2011, the project engineer traveled to Jean Marie River and Fort Providence to install solar irradiance monitoring equipment in the two communities. The sensors will collect solar irradiance data for at least one year, depending on the success of data capture and annual variation in weather (cloud cover, etc.). Once the study is complete, the sensors will be removed and pre-feasibility studies will be produced and distributed in both plain language and technical reports. These reports will be made available at www.nwtresearch.com

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File No: 12 410 901
Region(s): IN, NS, SS
Licence No: 14969
Location: Łutsel K'e; Behchokò; Ulukhaktok; Yellowknife

Brightening our home fires: Women and wellness project program report
Brightening Our Home Fires was a qualitative research project, which used Photovoice to explore women's perceptions, attitudes and experiences related to the prevention of Fetal Alcohol Spectrum Disorder (FASD) in the Northwest Territories (NT). Four communities participated: Behchokò, Ulukhaktok, Yellowknife and Łutsel K'e. Yellowknife was also included as women from remote northern communities often migrate to this urban location for reasons such as homelessness, domestic violence, substance abuse treatment, financial need, employment opportunities and a stronger resource network. Women participants were given digital cameras, some hands on training by research team members and an introduction to the research question: What does health and healing look like for you in your community?

About 30 women participated from the NT. The women provided beautiful images and captions from their communities about their understanding of health and healing – a foundation to FASD prevention. The photos and words that were shared with the research team provided a deep understanding of the need for culturally based health support resources. Key findings relate to the importance of children, relationship to elders and participation in traditional activities as important parts of health and healing. Photovoice helps women voice life experiences. FASD prevention requires involvement of women, men and communities.

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File No: 12 408 177
Region(s): NS
Licence No: 14934
Location: Yellowknife

Formative evaluation study of the BSN program
The formative evaluation study of the Bachelor of Science in Nursing (BSN) Program has collected some data from student and faculty focus groups and student questionnaires over the past six months. Unfortunately, this collaborative study across sites has been stopped by the Collaboration for Academic Education in Nursing (CAEN) Steering Committee. Information can still be retrieved specifically for Aurora College, until this point in the study. Therefore, there is no need to continue this research licence.

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File No: 12 408 149 **Licence No:** 14886
Region(s): IN,GW **Location:** Aklavik; Tuktoyaktuk

The Aklavik H. pylori project

In February 2011, the Inuvialuit Settlement Region (ISR) H. pylori pilot project was launched in Tuktoyaktuk, NWT. Of the 93 participants who enrolled in the pilot, 86 had a breath test for H. pylori infection, 35 provided health data, and 23 provided individual-level and household-level socio-environmental data. Using feedback from this pilot, planning is underway for the full ISR H. pylori project to launch in 2012.

One component of our community H. pylori projects is the collection of interview data on health problems related to H. pylori infection, along with relevant data from participants' medical records. In May 2011, we completed a project to assess the completeness of information obtained from medical records in Aklavik, and to improve our chart review tool to collect more accurate information.

In September 2011, a project examining ways to foster effective communication between researchers, knowledge users, and other community members involved in the Aklavik H. pylori project was initiated. This project aims to help promote the direct application of research knowledge to effective H. pylori screening practices, both in Aklavik and other remote northern communities throughout Canada.

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Region(s): IN **Location:** Aklavik; Ulukhaktok

Changing the "culture of smoking": community-based participatory research to empower Inuvialuit communities

This community-based participatory research (CBPR) project began in Aklavik and Ulukhaktok in 2007. CBPR team members completed baseline surveys in late 2008, and completed data entry in 2009. Data were checked and analyzed. A summary of findings was shared with communities in late December 2010. The response rate was 50% in Ulukhaktok and only 12% in Aklavik; in Ulukhaktok, 60% said they smoke every day and 25% are non-smokers, while in Aklavik these figures are 38% and 45% respectively. In both communities, peer pressure was the biggest reason to start smoking. Smokers in Aklavik expressed a much greater willingness to quit. In Aklavik, "health concerns" were mentioned by 56% of ex-smokers, but were mentioned by only 29% of ex-smokers in Ulukhaktok. A total of 52% of women in Ulukhaktok reported smoking during their most recent pregnancy, compared to only 30% in Aklavik. Aklavik smokers smoked more than Ulukhaktok smokers.

The teams launched a second smoking cessation challenge, the Be Smoke-free Challenge, in November 2010. Community responses were excellent, with 33% of the total population of Aklavik signing up, and 24% in Ulukhaktok. More non-smokers than smokers entered, and slightly more women and girls than men and boys.

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File No: 12 408 142
Region(s): IN,GW,SA,DC,NS,SS

Licence No: 14982
Location: community health centres, hospitals and clinic laboratories

RHD alleles in prenatal patients from northern Canada
No research was conducted under this license in 2011.

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File No: 12 408 184
Region(s): DC,NS

Licence No: 14981
Location: Yellowknife Primary Care Clinic and Stanton Territorial Hospital; Fort Simpson Clinic; Behchokò Clinic; Dettah Clinic

Evaluation of the electronic health record (EHR) system used in the Northwest Territories
No research was conducted under this licence in 2011.

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File No: 12 408 143
Region(s): NS

Licence No: 14932
Location: Behchokò; Gamètì; Wekweètì; Whatì; Yellowknife

Tłįchǫ Natsedzi Nihtsi: Tłįchǫ healing wind project / promoting sexual health
Despite many well-intentioned programs and policies, the burden of illness among rural Aboriginal communities continues to grow, particularly in the North. In 2006, the rate of sexually transmitted infections (STIs) in the Northwest Territories (NWT) was eight times the Canadian rate, at 20.4 per 1,000. In the same time frame, the rates in the Tłįchǫ Region were three times the NWT rate, at 67.5 per 1000. This summary describes how four rural and remote Aboriginal communities reduced their rates of syphilis and improved sexual health in the relevant age groups. The Tłįchǫ Community Services Agency (TCSA) Board and the Tłįchǫ Government strongly supported the development of community research

skills to provide the base for programs and policies that fit with regional priorities, including sexual health.

Traditional clinically based models were ineffective in reducing the STI rates in the region, so the TCSA designed a community-based strategy, which began with visits by community leaders to every household to provide information for families. Next, a region-wide survey conducted by trained community-based researchers showed how people learned about sexual health, and what their attitudes were towards related issues. The follow-up activities were hard to implement; people who were expected to do the knowledge translation were already busy in their full-time TCSA positions, and thus communication and program development were uneven.

To fill this gap, a team of young Tłı̨chǫ adults was recruited in May of 2009 to be trained as researchers and communicators. They worked with health professionals and others to develop, conduct and evaluate research to ensure that programming and policies continued to respond to community needs and priorities. The Community Action Research Team (CART) was trained by local people in cultural values, and by academics in research and communication skills. CART developed a series of programs and resources based on the survey findings. Examples include resource materials (e.g. pamphlets, booklets, manuals, posters, etc.), media (e.g. radio, DVD, web, blog, etc.), and community events (e.g. workshops in the community, youth conferences, puberty camps for boys and for girls, focus group discussions). Research and communications training and mentoring were provided by CIETcanada, an international non-government research organization. A second survey was conducted in 2010 to measure progress. That study revealed that condom use was making a difference, as was participation in CART-related activities.

This was an integrated program; at the health centre, the public health nurse trained one of the community health representatives to trace and visit contacts in the communities and encourage people to come to the clinic for testing. The education system welcomed classroom presentations. The CART members created a DVD for YouTube featuring local actors and elders. The integration of community, public health, education and social programs and academic perspectives created a collaborative approach that led to a series of activities to sustain the low rates of infection, and to support behavior change regarding sexual health. This is an on-going program, and activities will continue, with collection of biomedical data, frequent focus groups with affected age groups, targeted activities and regular evaluations to monitor the effectiveness of programs.

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File No: 12 408 183 **Licence No:** 14899
Region(s): IN,GW,SA,DC,NS,SS **Location:** Health Authorities of the NWT

Achieving high performance in health care priority setting
Between January and April 2011, we conducted an on-line survey of senior executive team members at the Regional Health Authorities across Canada. We received 92 responses, with 4% of total respondents from the Northwest Territories, representing four Health and Social Services Authorities. The survey inquired about structures, process features and behaviors related to organization-wide resource

allocation decisions in the health sector. Decision making rules and procedures, enabling and constraining factors, criteria, participation, and internal and external communications were among the topics addressed. Among key findings were the following: about one-half of respondents indicated that their organization used primarily a formal process for resource allocation, while the others reported that political or historical factors held sway. Seventy percent of respondents agreed or strongly agreed with the statement, "our resource allocation process is fair". Just over one-half assessed their own process as 'good' or 'very good'. Complete results are available upon request to the investigators.

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File No: 12 404 750
Region(s): DC,SS
Licence No: 14964
Location: From the Mackenzie River to approximately Birch Lake

Landscape scale flooding in the Great Slave Lake Plain

A comparison of tree growth records from sampling in 2010 and temperature and precipitation records from Fort Providence and Hay River suggested growth of trees in this region was influenced by a combination of temperature and precipitation. The relationship is convoluted in recent decades as many of the sampled trees became submerged by rising water, which affected their growth.

In 2011, 14 new sites and multiple species (white spruce, tamarack, jack pine) were sampled in areas thought to be unaffected by rising lake levels, which may provide a more dependable climatic relationship and strengthen confidence in results. In addition to the tree core samples, two lake-core samples from Caen Lake were obtained, which will aid in the understanding of past climates of the region. Tree- and lake-core samples are currently being analyzed.

Aerial photographs and satellite imagery of 12 lakes in the study area showed that some had dramatic changes in size between the late 1940's and 2010, while others had changed little. Most of the study lakes had flooded large areas in the late 1940's, up to 1971, were smaller by 1984, and then increased. Some grew to 8 – 10 times their earlier size.

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File No: 12 404 768
Region(s): IN
Licence No: 14916
Location: Arctic Ocean

ICESCAPE - Impacts of climate on ecoSystems and chemistry of the arctic pacific environment

No research was conducted under this licence in 2011.

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File No: 12 404 756
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Region(s): GW, NS **Location:** Point Lake; Russell Lake; Damoti Lake; Bell Lake; Rapitan; Yellowknife

Precambrian banded iron-formations: palaeoceanographic, palaeoclimatic, and palaeobiologic implications

During 2011, we reviewed the sampling conducted in 2010 in collaboration with staff from the Northwest Territories Geoscience Office. Activities were partially funded through a grant from the Canadian Circumpolar Institute (CCI Research Grants Program), and the Natural Sciences and Engineering Research Council of Canada (NSERC). Traditionally, investigations about banded iron formations (BIF's) and associated sediments have focused on sequences from South Africa, Australia, India, and Brazil. Geochemical studies on BIF's from Canada, especially from the NWT, however, are still scarce. Geochemical characterization of BIF's from the Northwest Territories provides relevant information to our understanding of the atmospheric evolution of Earth, as well as the chemical composition of the oceans during the Archean-Paleoproterozoic (2500 my ago), which ultimately lead to the appearance of animal life on Earth (~750 my ago). As a result of this work, two communications will be presented at (1) the 22nd Goldschmidt Geochemistry Conference (Montreal, June 2012, see attach), and (2) the 39th Annual Yellowknife Geoscience Forum (November, 2012). In addition, one paper about the geochemistry and geochronology of BIF's from the Northwest Territories is under preparation.

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File No: 12 404 735 **Licence No:** 14924
Region(s): IN **Location:** Ulukhaktok base camp

Northern base and precious metal potential, Victoria Island (NWT) and Nunavut

Major discoveries and achievements in the field (so far) include:
1) Completion of the planned mapping block in the Proterozoic rocks.
2) Completion of the follow up to the stream sediment survey.
3) Completion of the mapping and subdivision of the Paleozoic succession.
4) Documentation of the chemical heterogeneity of the volcanic succession, which indicates the existence of a complex feeder system with multiple vents.
5) Discovery of unconsolidated scoria, spatter and fumarolic deposits, and of pillow-hyaloclastite deposits, allowing us to localize vent complexes.
6) The association of native copper deposits with these fumarolic vent deposits. This provides, for the 1st time, a context for the occurrence of the native copper in the region.
7) Lateral facies and thickness variations of lahar-like deposits implying infilling of pre-volcanic topography.
8) Discovery of volcaniclastics and exhalites at the Killian-Kujjua transition, marking the awakening of the volcanic system at that time.
9) Recognition of pepperitic deposits on the fluviatile sands of the Kujjua.
10) Recognition of coarse volcanic deposits (possible agglutinate).
11) Discovery of two feeder complexes, that include sulphide-rich propagator tips. This suggests that wallrock assimilation did indeed trigger immiscibility in places.

12) Discovery of a sub-sill gossan zone, including rheomorphic breccias, hybrid magma bodies, graphitized black shales, and extensive sulphide stringers in the footwall.
13) Discovery of two more oxide-sulphide skarn systems associated with sills.
14) Discovery of ankaramitic lavas, which implies that primitive magmas were capable of reaching the surface, and so increases the size of the exploration target.

Community Engagement: Two graduating high-school students were involved as geological assistants for 2 weeks. Three Inuvialuit archaeological sites were discovered and reported to the ILA.The two OHTC wildlife monitors were extremely helpful, and we provided wildlife sighting logs to them.

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File No: 12 404 679
Region(s): DC, GW, SA
Licence No: 14870
Location: Inuvik; Norman Wells; Fort Simpson; Nahanni Butte; Wrigley

Recent changes in carbon source-sink relationships and greenhouse gas emissions in forest and peatland ecosystems along the Mackenzie Valley region of Canada
Summary of research not provided for this 2011 licence.

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File No: 12 404 777
Region(s): IN
Licence No: 14957
Location: Esso Tuk Base. 800 m east across Tuktoyaktuk Harbour from Tuktoyaktuk, ISR

Tuk Base demolition supplementary sampling
During the 1970's and 1980's Imperial Oil built a logistic base on the east side of Tuktoyaktuk Harbour called Esso Tuk Base. The land is Inuvialuit Private 1 (a) Land and is managed by the Inuvialuit Land Administration. Since about 2006, Imperial Oil has been cleaning up the site by removing old drilling supplies and equipment that is not required. Buildings and fuel tanks were demolished at the site during the summer of 2011. The debris from the demolition was sent to the south for disposal.

During past clean-up activities at the site, soil and water samples were collected to look at areas that may be contaminated by substances such as hydrocarbons, metals and salt. The past results found soil contaminated by hydrocarbons. In 2011, soil samples were collected to better understand the size of contaminated soil areas. Groundwater samples were collected from monitoring wells to continue the existing ground water monitoring program. Soil and water samples were sent for analysis at a laboratory in Edmonton.

The soil results have helped better determine where the boundary between contaminated soil and clean soil is located. The water results showed that contamination is not moving through the groundwater.

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File No: 12 404 729
Region(s): IN
Licence No: 14834
Location: 79N/108W or 80N/125W

O-buoy measurements of ozone, carbon dioxide and bromine oxide over frozen surface of Hudson Bay and Arctic Ocean
O-buoy instrumentation package is capable of long term measurements of the concentrations of bromine monoxide and two important greenhouse gases (ozone and carbon dioxide), along with a full suite of meteorological parameters, ice drift, sky and ice conditions. One of the two units that belongs to Air Quality Research Division of Environment Canada was deployed with the help of the Canadian Extended Continental Shelf Program at latitude 88.15° N and longitude 157.49° W on September 5, 2011. Data collected are transmitted on daily schedule via satellite and displayed on the public web site. Seven weeks of data have been collected, since the deployment. Data are in the process of being integrated into the Marine Weather Forecasting and International Artic Buoy Programs. O-buoy measured carbon dioxide and ozone concentrations are within the concentration range recorded by an identical unit over the ice of Beaufort Gyre. The project results were reported at the NWT IPY conference held in Inuvik in January 2011.

Data is currently being analyzed and the most interesting findings will be presented at IPY conference in Montreal in April 2012.

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File No: 12 404 707
Region(s): IN
Licence No: 14859
Location: South Melville Ice Cap

Melville Island South Ice Cap mass balance & snow pollution
Measurements of snow accumulation and ice melt were performed at 21 pole locations on the Melville South Ice Cap by D. Burgess and J. Zheng on April 18 and 19, 2011. The Melville Island South Ice Cap is a small plateau ice cap (76 km2 in size) that is located on the western portion of Melville Island in the Canadian high Arctic, NWT. Pole measurements indicate that the ice cap, as a whole, has thinned by 94 cm, which equates to a loss of 0.072 km3 (or 1 km x 1 km x 0.072 Km) of water to the ocean over the past year, as a result of warm temperatures during the summer of 2010. These melt rates are second only to 2007, which was the year of greatest mass loss experienced by the ice cap, since the record began in 1963. Temperature data downloaded from the automatic weather station on the ice cap

indicate that the 2010 summer melt season extended from early June to late August, with periods of sub-zero temperatures in early July and early August. Recent thinning has resulted in large areas of bedrock being exposed within the interior sections of the Melville South Ice Cap. These areas of bedrock have likely been covered by ice for several thousand years. Further investigation of these sites may offer insight into the age of the ice cap, and possibly the climatic conditions that prevailed at that time. Continued monitoring of the Melville South Ice Cap is important, as the rapid changes experienced by this ice cap are valuable for gaining insight into long-term climate change over the western Canadian Arctic region. Mass wastage of ice caps across the Canadian high Arctic is currently a significant contributor to global sea-level rise.

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File No: 12 404 325
Region(s): IN

Licence No: 14942
Location: Garry Island, Mackenzie delta area; Illisarvik, western Richards Island;Inuvik, near the Dempster highway; Paulatuk, near the Community Red Lake; Bar C; Seal Lake; Dennis Lagoon

Permafrost and climate change, western Arctic Canada

In 2011, we visited three sites for our research activities. We made two separate visits of 10 days at the Illisarvik drained lake site on Richards Island. There, we began to measure the small earthquakes that happen when ice wedges crack. We installed little data loggers that are meant to record ground shocks. They have not been used in the western Arctic before, so their installation was an experiment. We went to Paulatuk, in July, with Dr. Ross Mackay. Our research there was concentrated on ground temperatures and abrasion of rocks, as before. We continued our studies of permafrost conditions near Inuvik. In 2012, we will write up data on tilting of trees above permafrost. We have published two papers this year, one on changes in vegetation at the pingo near Paulatuk, and one on the place names of Herschel Island. The paper on vegetation at Pinguksayuk is the first paper to report changes in the distribution of willows in the western Arctic. It compared photos taken in 1910 with present conditions. A large amount of our work in 2011 was focussed on preparing a book about Herschel Island for publication. This will be available in April 2012. It will be 252 pages long and have over 400 photos, both historical and taken in the last 10 years.

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File No: 12 404 534
Region(s): GW

Licence No: 14919
Location: Near Fort McPherson

Chronology of thaw flow and geochemistry of associated massive ground ice. Fort McPherson, Northwest Territory, Canada.

In May and June 2011 field work was undertaken in the Stony Creek watershed (NWT), to study the impacts of retrogressive thaw slumps on the terrestrial and aquatic ecosystems. The work was performed by students and professors from the University of Ottawa, with valuable field assistance provided by Gwich'in monitors from Fort McPherson. Below we provide the tasks performed during our field season and anticipated outcomes.

1. Data loggers that record water quality measurements, such as water level, conductivity and turbidity, were installed in streams above and below two thaw slumps, to monitor the quality of clear tundra streams and streams impacted by slump runoff. At these two sites, stream velocity measurements were taken to calculate ionic and sediment fluxes used to determine the contribution of slump runoff to the overall stream budget.
2. A survey of stream water quality in the Stony Creek watershed was performed, during both field campaigns. Here, stream water samples were collected at the mouth of Stony Creek, at several locations above, within and below the thaw slumps and from clear tundra streams. The samples were analyzed for major dissolved ions and suspended sediments. The data will allow us to assess the impacts of slumps on the water quality downstream.
3. Permafrost drilling was undertaken in a thaw slump, to obtain samples of ancient peat and soil, in August, 2011. The peat will be analyzed for iodine, iodine-129 and carbon-14 using facilities at the University of Ottawa. The permafrost was also analyzed for major ions and stable isotopes to characterize the sediment in the thaw slumps and permafrost melting. The outcome of these analyses will allow us to investigate changes in the fallout of iodine-129 in the recent past, as well as hundreds of years in the past.

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File No: 12 404 716
Licence No: 14844
Region(s): SA,NS
Location: Grouard Lake; Lou Lake; Gamètì; Cole Lake

GEM Great Bear magmatic zone/iron oxide copper-gold deposit project

The Great Bear magmatic zone is a geological belt that extends from Great Bear Lake to Great Slave Lake. The belt hosts two iron oxide-copper-gold (IOCG) deposits and has a very high mineral potential for other undiscovered IOCG and affiliated deposits. It remains, however, significantly under explored. The current project, within the Geomapping for Energy and Minerals program, and its partners have now laid a solid geoscientific foundation for exploring IOCG in the region and for land use planning. In summer 2011, NRCan conducted fieldwork in partnership with the Community Government of Gamètì, academia, and Fortune Minerals. The project models, techniques and mapping protocols for IOCG systems were tested southwest of Lou Lake and east of Gamètì. While based in Gamètì, Tłįchǫ community members were employed and helped test the mapping protocols on an area centered on the historic Fab Lake showings. Field observations confirm the effectiveness of the protocols and highlight the ability of IOCG systems to create affiliated mineralization, such as albite-hosted uranium. Interim results were presented nationally and internationally, including at the Yellowknife Geoscience Forum, with formal publications to follow. Results are attracting attention of exploration companies and scientists worldwide and pave the way for a new cycle of mineral exploration in the region and new collaborations.

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File No: 12 404 763
Region(s): NS

Licence No: 14898
Location: Fortune Mineral's NICO property, along the route of a proposed all-weather access road from Highway 3

Environmental baseline surveys of the Fortune Minerals Ltd. NICO project
No research was conducted under this licence in 2011.

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File No: 12 404 359
Region(s): IN, GW

Licence No: 14836
Location: Mackenzie Delta; Richards Island

Mackenzie Delta shallow gas and permafrost studies
This multi-year project attempts to quantify geohazards and environmental considerations related to release of methane gas from aquatic and terrestrial areas in the outer Mackenzie Delta, with special emphasis on the controls of permafrost and gas hydrates. We conducted two field programs in 2011. In late-March, we deployed two aquatic moorings, to record the acoustics (sound characteristics) of gas discharge at two of our gas seep study sites. We were then able to convert the acoustic data in gas flux measurements, to investigate temporal variability in gas discharge. We also deployed two dissolved oxygen sensors, to investigate changes in dissolved oxygen concentration over time. In October, we deployed water column samplers for analysis of water properties at three sites. Our research results have been submitted to a journal for publication and have been presented at several national and international meetings. This work will ultimately assist in understanding if the warming permafrost and gas hydrate deposits found in outer the Mackenzie Delta pose a hazard to hydrocarbon development or surface activities and also assist to calibrate fluxes of greenhouse gases.

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File No: 12 404 743

Licence No: 14923

Region(s): IN

Location: The coastline of the Beaufort Sea, from the Alaska/Yukon border to the Northwest Territories/Nunavut border

Assessing the potential for environmental sensitivity index mapping in the Arctic using synthetic aperture radar

In late July-early August, we collected geo-tagged oblique video and audio commentary over almost 3000km of NWT coastline, from Alaska to Nunavut. RADARSAT-2 and TerraSAR-X satellite imagery were acquired at different periods of time and at different incidence angles over the study sites. All study sites are also covered with optical data (SPOT and LANDSAT). Radar and optical data analyses will be conducted independently, to determine the most suitable techniques and optimal datasets to differentiate the shoreline types (intertidal and supratidal zones). Textural analysis and polarimetric data will be generated and used with ancillary datasets, such as bathymetric data, surface deposits maps and wind data to classify shoreline type. Comparisons between the traditional approach (oblique video) and remote sensing techniques will be conducted to verify if the satellite products are as reliable as the traditional approach. A series of ground plots was also completed in Ivaavik National Park and in the Anderson River *Migratory Bird Sanctuary*. An intensive ground program was also completed on Herschel Island, where we also acquired 2 hyperspectral images from the European satellite CRIS. The shoreline video will be interpreted into a Beaufort Coastal Sensitivity Atlas and research results on satellite analysis will be completed through the winter and reported next year.

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File No: 12 404 752
Region(s): NS

Licence No: 14884
Location: Matthews Lake; Courageous Lake; Dumbell Lake; Jolly Lake; Sandy Lake

Courageous Lake project

The 2011 environmental baseline program collected data, to characterize the physical and biological setting of the proposed Courageous Lake project area. The following activities were carried out:

- Meteorology: The meteorological station and wind tower were maintained. Ten snow course surveys were completed at representative locations across the project area.
- Air Quality: Dust fall monitoring was undertaken at five stations, every 30 days over the summer.
- Noise: Six stations were monitored for 24 hours in spring.
- Hydrology: Eight hydrological stations were established. Water current velocity and related flow discharge measurements were determined throughout the open-water season. Current meters were installed in Courageous Lake, during the open water season, to obtain data.
- Bathymetry: Surveys were completed at Courageous Lake, Matthews Lake, and two unnamed lakes of interest.
- Hydrogeology: Two groundwater wells were drilled and Westbays installed. Packer testing was undertaken, to determine hydraulic parameters of aquifers. Water samples were taken from aquifers below the permafrost. Data loggers were installed on existing thermistor strings. Measurements were collected from thermistor strings.

- Aquatics: Water quality was sampled at 14 lakes and 9 streams three times over the summer. A subset of these lakes was sampled in March. Sediment quality and primary and secondary producer communities were sampled in mid-summer.
- Fish and fish habitat surveys: 65 lakes and 43 streams were sampled. 15 lakes and 13 streams were identified as fish bearing. 2 lakes and 25 streams were found to be dry or not flowing during freshet. Sensitive Habitat Inventory and Mapping (SHIM) were undertaken for Matthews Creek.
- Ecosystems: Terrain mapping and soil samples were collected, in conjunction with vegetation surveys, in the project area. Field surveys were conducted to identify wetlands in the proposed project area.
- Baseline reports will on the above aspects will be available in March 2012, when data analysis and report writing has been completed.

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File No: 12 404 652
Region(s): IN
Licence No: 14917
Location: Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region

ArcticNet: an integrated regional impact study of the coastal western Canadian Arctic.
Since 2004, ArcticNet has been using the Canadian research icebreaker CCGS Amundsen to carry out sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region, as part of its ongoing marine-based research program. The central aim of this research program is to study, on a long-term basis, how climate induced changes are impacting marine ecology, contaminant transport, biogeochemical fluxes, and exchange processes across the ocean-sea ice-atmosphere interface in the Canadian Arctic Ocean.

In 2011, sampling operations in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region were carried out from the CCGS Amundsen, from 11 August to 04 October. During these 55 days, researchers sampled at over 50 oceanographic stations. Sampling operations included deployments of a CTD-Rosette, box corer, Agassiz trawl, and plankton nets. A total of 4 sub-surface oceanographic moorings were deployed. In addition, a multitude of oceanic and atmospheric parameters were measured continuously, using the Amundsen's impressive array of continuous samplers (SM-ADCP, EK-60 scientific echosounder, water surface pCO2 and CTD on track system, foredeck and top bridge meteorological towers, ceilometers, radiometer and all-sky camera). The ship's EM302 multibeam sonar and Knudsen sub-bottom profiler collected over 15,000 km of high-resolution bathymetry and sub-bottom data. From the vessel's wheelhouse, hired Inuvialuit Marine Wildlife Observers sighted and identified marine mammals and seabirds.

Data collected from this multi-year program will contribute to a better understanding of the impacts of climate variability and change on the physical, biological and geochemical processes in the Beaufort Sea/Mackenzie Shelf/Amundsen Gulf region.

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File No: 12 404 687
Region(s): NS
Licence No: 14943
Location: Daring Lake Terrestrial Ecosystem Research Station

Controls on carbon and nutrient cycling in arctic tundra

The following describes the progress made during 2011, as it pertains to one of the specific research questions outlined in the original application:

What are the principal controls on the functioning of common tundra ecosystem types, and how are they likely to be affected directly and indirectly by climate change?

A manuscript is currently in review with Global Change Biology, demonstrating that birch shrub apical growth, at the Daring Lake research site, is limited as much by the availability of phosphorus as it is by nitrogen. This is a very surprising result. For many researchers across the Arctic, the focus has been on nitrogen. The biogeochemical cycling of phosphorus is fundamentally different. Based on this result, our understanding of how low arctic terrestrial ecosystems function, as well as how plant growth and vegetation change will be affected by climate warming, will be determined by the changes in both the availability of phosphorus and nitrogen.

Most of the summer was spent at Daring Lake collecting vegetation and soil samples from a greenhouse warming experiment. Samples are currently being processed, in order to determine the potential for warming to alter nitrogen and phosphorus availability, as well as vegetation change in response to rising air and soil temperatures.

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File No: 12 404 774
Region(s): DC
Licence No: 14946
Location: Lue Túé Sulái (the Five Fish Lakes), near Jean Marie River, including Ekali Lake (Ezáa Lue Túe), Sanguez Lake (Tl'onie Túé), Gargan Lake (Tli?te?ti?i?), McGill Lake (Tthets'éhk'e'), and Deep Lake (Dechi? Ná?a)

Ecological assessment field work for Lue Túé Sulái (the Five Fish Lakes) candidate cultural conservation area

The survey was conducted in August 2011 and was supported by the Jean Marie River community and a larger DFN-AAROM collaborative management initiative. Three of the five lakes within the candidate area were sampled: Ekali, Sanguez, and Gargan Lakes. An inflow, centre and outflow site were established for each lake. Some measurements were taken at the sites and water samples from the surface were shipped to and analysed by Taiga Labs, Yellowknife.

The water quality within all three lakes is generally good. Water temperature was uniformly warm, pH was slightly basic, major ion concentrations were moderate, and nutrient, chlorophyll and metal concentrations were low. However, dissolved oxygen was often reduced, mostly at depths below 5 meters in Ekali and Sanguez, but 50% saturation values were recorded for all depths within Lake Gargan.

Shoreline observations were made for each station. Vegetation was similar and ranged from Black Spruce and Tamarack through Birch, Aspen & Willow to Alders, Dogwoods and Rosehips. Emergent vegetation generally occurred in the shallows and near shore sediment ranged from organic, woody debris to sandy and small rocks.

Elders provided traditional knowledge, to identify spawning areas and good fishing sites for each lake and the creeks between them. General hydrological observations were also documented.

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File No: 12 404 769
Region(s): SA
Licence No: 14921
Location: The Northern Mackenzie Mountains, specifically in the Sheep Lake/Mountain River area

Late Proterozoic stratigraphy of northwestern Canada and its record of Earth system evolution

In July 2011, a research group consisting of geologists from Queen's University and Harvard University visited outcrops of the latest Precambrian sedimentary rocks in the Sekwi Brook region of NWT. The purpose of this research was to better understand the age and depositional setting of sedimentary rocks deposited during intervals of extreme glaciation and in which some of the earliest animal fossils in the world are found. Fieldwork consisted of mapping of these rocks and collecting rock samples for geochemical analysis. Early results include:

1) the most precise age estimate yet produced for one of these glacial events.
2) new data bearing on the water depth and oxygen content of the sedimentary basin in which these early animals resided.

Importantly, the geological mapping has shown that some of the fossil occurrences, which based on prior mapping appeared to significantly pre-date other similar fossils globally, are in fact younger than thought and hence do not constitute an outlier that forces rethinking of earliest animal evolution. Nevertheless, the new work provides a valuable new geological framework for interpreting the environmental setting in which these early animals lived. This project ties in with an ongoing research program on similarly-aged rocks in Yukon.

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File No: 12 404 710
Region(s): IN

Licence No: 14895
Location: Sachs Harbour; a N/NW route approximately 200 Km from Sachs Harbour and then returning to Sachs Harbour along the same path

Polar airborne measurements and arctic regional climate model simulation project
The campaign polar airborne measurements and arctic regional climate model simulation project (PAMARCMIP) 2011 was performed from March 25, 2011 until May 06, 2011. The aircraft was operated by the Canadian Aviation partner Kenn Borek Air Ltd. Scientists from different research institutes, including Germany, Canada, and USA were involved in the project. We performed airborne measurements (127 flight hours) in the inner Arctic over six weeks and successfully completed a traverse from the North American Arctic (Barrow, Alaska) to the European Arctic (Longyearbyen, Svalbard). Northward flights were performed over the Arctic Ocean from Barrow, Inuvik, Eureka, Alert, Station Nord as well as Longyearbyen. We arrived in Inuvik on April 3, 2011 and left Inuvik on April 6, 2011. During this period we performed two research flights, measuring ice thickness, trace gases, aerosols and meteorological parameters over a key region of the Arctic. Unfortunately the planned landing in Sachs Harbour, with the aim to extend the endurance for the research flights, was cancelled, due to bad weather conditions. Measurements were also made during the ferry flights from Barrow to Inuvik on April 3, 2011 and from Inuvik to Resolute Bay on April 6, in the altitude range of 10 000 feet.

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Region(s): SS

Licence No: 14892
Location: Along the Hay River

Hay River ice jam study
The 2010 field research program brought members of the University of Alberta (U of A) team, and colleagues from the Department of Indian Affairs and Northern Development (DIAND) to the Town of Hay River, to observe, measure, and document river breakup ice conditions (April 19 to May 10). During breakup, U of A/DIAND field crews worked with the Town Flood Watch Committee, to measure ice jams and to document the river's breakup progression. Breakup was relatively uneventful that year, with low water/ice levels and no flood threat. Nevertheless, there were numerous ice jam formation and release events along the river, providing excellent scientific data to aid in the advancement of our flood forecasting models.

Operational testing of these U of A ice jam flood forecasting models continued during breakup 2011. The timing of the onset of breakup, the expected peak snowmelt runoff stream flow and the time of arrival of the ice runs from were all predicted with reasonable accuracy. Further research is needed to identify when these incoming ice runs will actually stall upstream of the community, and breakup 2011 provided valuable data towards understanding this scenario. The U of A and DIAND researchers will be providing the Town of Hay River with an update on the flood forecasting model development project prior to breakup in 2012.

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File No: 12 404 717
Region(s): GW, DC, SS
Licence No: 14925
Location: The Mackenzie River and its main tributaries

Geological carbon in the Mackenzie River Basin: sources and sinks of atmospheric carbon dioxide

In May and June 2011, the research team spent their third consecutive year sampling river sediments in the Mackenzie River Basin. Again, we found it essential to have had logistical support from the Aurora Research Institute, Environment Canada, and the local communities, with whom we discussed the project before fieldwork. We are very grateful for this assistance. As in June 2009 river water and suspended sediment samples were collected from 'depth profiles' within river channels, using our custom-built, clean, depth sampler. At the same time, we used an 'Acoustic Doppler Current Profiler', to measure the speed of the water in detail. We are still in the process of interpreting the data and writing up the scientific results of our study.

In 2011, we hoped to collect samples from the river as close to the freshet (ice break up) as possible, because this is when the rivers carry most of their sediment. We are pleased to report that the campaign was a success. The May 2011 samples are the most sediment-rich we have collected in the three years of work on the Mackenzie River. The increase in sediment concentration with water depth is also useful to us. It means each sample reflects different sizes and masses of particles, which we can investigate. We are currently analyzing the samples for their chemistry, to better understand the source of carbon contained in the water and sediments.

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File No: 12 404 713
Region(s): GW
Licence No: 14881
Location: The Mackenzie River, near Inuvik; from shore, and near the ferry crossing, near Tsiigehtchic

Arctic great rivers observatory

This project studies the 6 largest rivers that flow into the Arctic Ocean: in North America, the Mackenzie and Yukon; and in Russia, the Ob', Yenisey, Lena, and Kolyma. We are measuring the concentration of naturally occurring chemicals, such as carbon, nitrogen, and phosphorus, in these rivers to obtain baseline information about the flow of these chemicals to the ocean, and to help us understand how climate change is impacting Arctic rivers.

This is a 3 year project, and we are now nearing the end of the third year. Most of our samples have been collected, but laboratory analyses are still underway. All data from this project is posted on a public website (http://arcticgreatrivers.org) and is available for free download by the public.

We took 2 sampling trips to the Mackenzie River in 2011. In late May and June, we took daily 1 liter samples of river water from the shore near Inuvik, as well as 3 samples by boat near the Tsiigehtchic ferry crossing. In September, we took one sample by boat near Tsiigehtchic. All boat samples were less than 15 liters of water. During our 2011 sampling year, we were fortunate to have Will Storr (of Fort McPherson / Tsiigehtchic) provide local field support.

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File No: 12 404 661
Region(s): DC

Licence No: 14937
Location: Historic seismic lines near the Mackenzie Highway, between 61-62°N and 120°30'-121°30'W; several sampling sites will be located in the Scotty Creek Research Basin,

Investigating the effects of winter overland travel in sub-arctic boreal forest

The objective of this project is to investigate terrain conditions associated with transportation infrastructure, specifically seismic lines, in discontinuous permafrost. In July 2011, researchers met with staff from the Liidlii Kue and Jean Marie River First Nations, to discuss the project and opportunities for local involvement. Measurements were obtained at several road-accessible seismic lines. In areas underlain by permafrost, active layers were significantly thicker along seismic lines than in undisturbed areas. Subsidence in the order of centimeters was observed along the seismic lines, leading to wetter conditions and different vegetation. In August 2011, sites were established in 3 common terrain units adjacent to the Liard Highway: peat land, fen, and till. The sites were instrumented with shallow (1 m) ground temperature cables, soil moisture and air temperature sensors. Results from these sites will establish the natural variability of active layer freeze back between different terrain types. Deep (10 m) ground temperature cables were installed in the Scotty Creek basin at a channel fen, and at the center and edge of a degrading peat land. Shallow and deep ground temperature cables were also instrumented along a nearby winter road and seismic line. Results may indicate how line widths, line orientation, and ground-ice content relate to permafrost resilience along disturbance corridors.

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File No: 12 404 545
Region(s): IN, GW

Licence No: 14840
Location: Mackenzie Delta

Environmental studies across treeline

This study is a northern-based collaborative program initiated by the Renewable Resources Directorate, AANDC, in 2004. It is designed to enhance the understanding of environmental conditions in the region, through scientific studies and monitoring. In 2011, we continued to monitor permafrost and active layer temperatures in the Delta region, by visiting previously established sites by helicopter and boat. This was the third year of active-layer freeze back monitoring, and results indicate that different terrain types freeze back in the same order each year, but there is significant variation in the timing of freeze back between years. This information will be useful for decision makers for permitting winter overland travel. In 2010, we removed tall shrubs from an abandoned delta drilling mud sump in an attempt to promote freezing conditions. Lower ground temperatures were measured in 2011 in the sump cap at depths up to 3 m. Continued monitoring may indicate that vegetation removal is a valuable long term sump maintenance technique. Ground temperatures were measured near proposed Mackenzie Gas Pipeline stream crossings. The thermal regime of stream valleys is significantly different than adjacent uplands, and an understanding of these differences is important for pipeline construction in the region.

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File No: 12 404 545
Region(s): GW

Licence No: 14842
Location: Stoney Creek catchment, which runs parallel to the Dempster Highway and empties into the Peel River at Fort McPherson, NT

Evaluating the environmental impacts of permafrost mega-disturbances along the Dempster Highway, NWT

This project studies the cumulative impacts of permafrost slumping on the land and water and addresses several landscape change, water and fisheries questions that have been determined through the regional Renewable Resource Council (RRC) gatherings, Gwich'in Renewable Resources Board meetings and the Gwich'in Water Strategy Workshop. This project studies the impacts of big slumps on streams and fish in the Peel Plateau. Mapping shows that there are hundreds of big slumps like those seen off of the Dempster Highway. The slumps are impacting the Rat, Willow, Vittrekwa, Trail, Road and Caribou Rivers, as well as Stony Creek. By looking at old air photographs we determined that the slumps are much bigger than in the 1970s.

Studies tell us that the big slumps cause major changes to landscape and the streams and these changes impact what can live in the streams. The streams become choked with mud. Slumps are having impacts on water in the Peel River.

The support of the Tetl'it RRC and the community of Fort McPherson have been a key to the success of this project. In 2011, the CIMP project funded about 100 days of employment to community members from Fort McPherson. Community members helped researchers decide where to sample water, to travel safely and respectfully on the land and they have made many observations of changes to the environment. Community monitors have collected information on plants, berries, permafrost, water and the health of the streams. The Tetl'it RRC played an important coordinating role and administered funds to community researchers.

The study is providing information to support fish and wildlife management, and planning and maintenance of community and transportation infrastructure. The data users include the Department of Fisheries and Oceans, the Community of Fort McPherson, the Department of Transportation and the Gwich'in Land Use Planning Board.

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File No: 13 404 770
Region(s): IN,GW

Licence No: 14928
Location: Along about 5 km of traditional trail between about 2 km west of Aklavik and 7 km west of Aklavik, west of the junction with the Peel Channel

Proposed Aklavik west road and bridge - Hydrotechnical and geotechnical field investigations
In 2011, Nehtruh-EBA Consulting Ltd. did a research program at Bridge Creek, about 3.5 km west on the traditional trail from Aklavik, NT to the Richardson Mountains. The people in Aklavik have made some different bridges over the creek, but the bridges usually wash away in spring.

So, in June 2011, Nehtruh-EBA sent a hydrotechnical engineer and a surveyor to look at the bridge site, and take some measurements of the stream bed and flood levels. They also took measurements at the Water Survey of Canada gauge on the Peel Channel, so that they would have some flood history with which to compare. Two local environmental monitors helped with the work. Now the hydrotechnical engineer can design a bridge high enough not to wash away when there is a flood. The information from the surveyor helps him to do his calculations.

In August 2011, Nehtruh-EBA asked an air photo company to fly over the first part of the traditional trail and take some photos looking straight down. The photos overlap, so if you look at them through special glasses, it is like a 3D picture. This 3D picture helps the engineers see problem areas along the trail, and helps them think of ways to keep the trail good for travelling. It also helps them find sand or gravel to improve the trail if needed.

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File No: 12 404 621

Licence No: 14851

Region(s): NS **Location:** Daring Lake

Exchange of carbon gas fluxes over low arctic tundra

We continued our research into carbon fluxes from arctic tundra, near Daring Lake, NWT, in 2011. Instruments were set up in early May and continued operating until late August. We made measurements at 4 different tundra types: fen, mixed heath, low shrub heath and tall shrubs. At each site, we measure carbon dioxide fluxes between the tundra and atmosphere. The overall objective is to see if the tundra is taking more carbon dioxide out of the atmosphere by plant photosynthesis than it is releasing by respiration. If more goes in than goes out, the tundra is a sink for carbon and if more goes out, it is a source. As carbon dioxide levels in the atmosphere build up from burning gas and oil, we hope the tundra is a sink, which indeed our 2012 results seem to show for all the sites. We measured important differences in how much carbon dioxide is taken out among the sites. For example, the tall shrubs are a larger sink than the heath and low shrubs, but about the same as the fen. This research helps us to understand how arctic tundra will influence the amount of carbon dioxide in the atmosphere and thus how it might influence the climate today and into the future.

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File No: 12 404 767 **Licence No:** 14913
Region(s): SS **Location:** Near the former Pine Point Mine

Pine Point project (N-204)

Seven dust fall monitoring stations were installed and over 90 samples collected, along with noise monitoring. Water bodies at all deposit areas, as well as Great Slave Lake, were surveyed to characterize water quality and measure baseline metals in sediment. Fish populations were surveyed at over 50 sites in the deposit areas and habitat assessed. A 170 meter deep borehole was drilled and tested at the R-190 deposit and hydraulic testing was done at the upper Pine Point Formation. Six monitoring wells were drilled and installed at the N-204 deposit, and hydraulic testing and sample collection was completed. Four site visits were completed for hydrologic flow characterization, and hydrometric monitoring stations were installed along the Buffalo River and Twin Creek, to record surface water elevations. Fifty-onesamples from deposit areas were tested for metal leaching potential. Soils and vegetation field data were collected at 80 inspection sites within the six deposit areas, to classify terrain and ecosystems, and to characterize soils for soil salvage. Forty-five plant samples and 22 soil samples were collected from a subset of the inspection sites, to determine levels of baseline metals. The study area was surveyed for wetlands, which were then mapped. An archaeological assessment was conducted and four prehistoric sites were recorded. Potential land users and key socio-economic informants will be identified and interviewed in the fall and winter, to determine existing levels of land use near the project area and to characterize the social and economic environment. Traditional knowledge studies are planned to be conducted in 2012, in collaboration with aboriginal groups near the Pine Point project area (Akaitcho Territory Government, Deh Cho First Nations, Deninu Kue First Nation, Hay River Dene Band/Katlodeeche First Nation, Northwest Territory Métis Nation, and West Point First Nation).

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File No: 12 404 733
Region(s): NS,SS
Licence No: 14894
Location: The Kennady Lake watershed

De Beers - Gahcho Kué environmental monitoring program

Baseline environmental studies were completed during the spring, summer and fall in the area surrounding the Gahcho Kué project in 2011. The surveys were conducted with the assistance of representatives of the Yellowknife Dene First Nation and Łutsel K'e Dene First Nation. The studies encompassed weather, air quality, fisheries, water quality, and hydrology.

The hydrological regime was monitored through measurement of water levels and river flow between each water body. Meteorological data was recorded starting in August from the weather station at site. Noise monitoring was not required in 2011.

Fish surveys were completed in small lakes and streams throughout the local study area and at Kennady Lake. The surveys included gill netting, electro-fishing and minnow trapping. Fish habitat was also mapped in the surrounding streams and small lakes.

Water samples were collected to update water quality information for Kennady Lake, and surrounding and downstream lakes. Stream outlets and lakes were surveyed, along with the watershed adjacent to Kennady Lake. Benthic invertebrate sampling was also completed in the lakes.

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File No: 12 404 773
Region(s): NS,SS
Licence No: 14944
Location: Within Avalon's Thor Lake Property, 100 km southeast of Yellowknife

2011 baseline studies for Avalon Rare Metals Inc. proposed Thor Lake rare earth element project - surface water hydrology and climate

The objective of the surface water hydrology field program was to characterize the surface water hydrology and meteorological conditions at the Thor Lake site.

Surface water hydrology field work, during 2011, included water level monitoring in the following lakes at the project site: Thor, Long and Cressy lakes. Water levels were recorded using a Hobo pressure transducer and water level gauge secured to the lake or stream bed. Stream flow monitoring was completed at the outlets of Thor, Long, Fred and Murky lakes. Stream flow measurements were taken following standardized methods for stream flow in May and October.

Meteorological conditions were monitored at the Thor Lake site, using an AXYS Watchman 500 weather station. Data were periodically downloaded and compiled; station maintenance was also completed. Lake water levels, stream flows, and meteorological data was compiled, analyzed, and compared to regional data. Deton'Cho Stantec produced an updated technical data report in December 2011.

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File No: 12 404 708
Region(s): NS, SS
Licence No: 14835
Location: Barnston River; Beaulieu River; Hoarfrost River; Waldron River

NT Hydro hydrology monitoring program
In May 2010, NT Hydro's contractor, Water Survey of Canada, installed water gauging stations on the Hoarfrost, Barnston, Beaulieu and Waldron Rivers. Gauging stations are remotely operated and collect hydrology data on a full time continuous basis. The goal of the program is to collect hydrology information, to better understand the hydrology and hydro potential of these rivers in this area of the NWT. The four stations continue to collect data to develop a complete hydrology record.

Hydrology information collected includes: water level, water and air temperature, water volume and velocity. Data will continue to be collected for the next 2-3 years, to develop a hydrology record for the rivers. Once enough data has been compiled, NT, Hydro will be able to evaluate the hydro potential of these rivers.

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File No: 12 404 612
Region(s): IN
Licence No: 14935
Location: Mackenzie Delta

Coastal geoscience research in the Beaufort Sea and Mackenzie Delta
No research was conducted under this licence in 2011.

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File No: 12 404 529
Region(s): SA
Licence No: 14858
Location: Mackenzie Mountains near Norman Wells and Tulít'a

Geological fieldwork in Mackenzie Plain and adjacent mountains.
A team of eleven scientists from the Geological Survey of Canada (Calgary), University of Calgary, University of Ottawa, University of Saskatchewan, Texas A&M University, and James Madison University did geological field work based out of Norman Wells, for five weeks in July and August, 2011. Working with them was a Wildlife Monitor from Norman Wells. Two scientists also worked out of Tulít'a for one week in July, accompanied by a local Monitor. Helicopter, accommodation, and food services were provided by local businesses.

Field work involved helicopter visits or overland hiking to 458 rock outcrops on ridges and streams from the eastern Mackenzie Mountains to the Franklin Mountains. Locations and rock descriptions were recorded, and rock thicknesses and orientations were measured. Approximately 300 rock samples were collected, varying from fist size to slightly larger than a loaf of bread. Samples were shipped to labs at the Geological Survey of Canada in Calgary, or at the above mentioned universities, where they are undergoing paleontological, geochronological and organic chemistry analyses. Data are being used to produce new geological reports and maps of bedrock geology for the Norman Wells and Tulít'a region (NTS map areas 96C, 96D, 96E, and 96F).

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File No: 12 404 378
Region(s): IN, GW

Licence No: 14837
Location: Trail Valley Creek; Havikpak Creek; Denis Lagoon; Big Lake, 65 km W of Tuktoyaktuk, 130 km N of Inuvik; 75 km E of Tuktoyaktuk

Hydrological studies, Mackenzie Delta region
With a changing climate and increasing development, there is an urgent need for appropriate hydrological information (snow cover, soil moisture, soil temperature, and stream discharge) in the western Canadian Arctic. For example, the design of roads and pipelines requires estimates of maximum stream discharge, while rules controlling land access in the fall require estimates of snow cover and whether the soil is frozen. However, with a changing climate, the recent past may not be a reliable guide to the hydrological conditions in the near future. As a result, in order to limit the environmental impact of development, the research team needs better methods to predict future conditions.

The research program is aimed at developing such improved methods, and over the last year has:

1) collected hydrologic data at two study sites, in order to extend the 20+ year data set.
2) extended the data collection by installing new state of the art equipment. This year, the research team installed a continuous GPS unit that will collect important snow and soil information.
3) continued to develop better methods to predict future changes in snow cover, soil moisture, ground thaw, and stream flow.

Recent results consider the factors controlling the thaw of the upper layer of the ground over the summer period. This is an important step towards better predictions of the impact of a changing climate and developments on the hydrology of the region. Other results have considered the role of lakes on the hydrology and ecology of the Mackenzie Delta.

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File No: 12 404 728
Region(s): NS,SS
Licence No: 14880
Location: Snap Lake and the regional study area (33 km radius from camp)

De Beers Snap Lake Mine - 2011-2014 environmental monitoring program
Monitoring of water quality, sediment quality, zooplankton, phytoplankton, benthic communities, fish, fish habitat, and fish health was successfully carried out in the 2011 field season. The hydrology program monitored lake levels, stream-flow, and outflows; measured site runoff; and collected hydro-meteorological data. Additional water quality monitoring was conducted during construction and installation of the new diffuser. The 2011 aquatics program results have yet to be analyzed and reported. This information will be available in the 2011 Aquatic Effects Monitoring Program (AEMP) Annual Report for Snap Lake which will be submitted to the Mackenzie Valley Land and Water Board (MVLWB) by March 31st, 2012 and available on the MVLWB Public Registry online at (http://www.mvlwb.ca/mv/registry.aspx).

Many parameters were measured as part of the 2011 geochemistry monitoring program. An annual site inspection to monitor site runoff/seepage, review the placement of materials, and identify any signs of acid generation was also carried out in September. The summary field report for this inspection is available on the Public Registry. The air quality monitoring program involved the collection and processing of meteorological data from the onsite weather station, as well as the measurement of particulate matter and dust-fall from sampling stations on site. No vegetation monitoring was carried out in 2011. As per the Vegetation Monitoring Plan, the next vegetation monitoring at Snap Lake will take place in 2013. The results of all these monitoring programs will be submitted in the 2011 Annual Report, which will be available on the MVLWB's Public Registry.

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File No: 12 404 727
Region(s): NS
Licence No: 14876
Location: The project area is on the Hearne Channel of the East Arm of Great Slave Lake, 90 km southeast of Yellowknife

Blatchford Lake, NT airborne gravity gradiometry survey
The objective of this research was to acquire high-resolution gravity gradiometer and aeromagnetic data, in the Blatchford Lake, NT area, centered on the Thor Lake rare earth element (REE) deposit. The

gravitational field measured by this survey reflects lateral variations in the density of underlying rocks. The aeromagnetic survey measured magnetic properties of bedrock. Both data types are tools used in geological mapping. Understanding these gravity and magnetic data will help geologists map the area, assist mineral exploration activities, and provide information necessary for communities, aboriginal associations, and government to make land use decisions.

The survey collected approximately 3,066 line km of data flown along parallel lines spaced 250 m apart. The flying height was at a nominal terrain clearance of 100 m. The horizontal gradient of gravity and the intensity of the total magnetic field were measured from the aircraft.

The survey was flown between March 19, 2011 and March 23, 2011. Final data have been accepted for the survey. The data and maps were published on October 14, 2011. The data are available for free download from the Geoscience Data Repository for Aeromagnetic and Electromagnetic Data (http://gdr.nrcan.gc.ca/aeromag) and digital versions of the maps are similarly available from MIRAGE (http://gdr.nrcan.gc.ca/mirage). The survey results were presented at a poster session of the Yellowknife Geoscience Forum on November 15-17, 2011. The poster was entitled Geological significance of a new high resolution gravity gradiometric and magnetic survey over the Blatchford Lake Complex.

The data acquired over the Blatchford Lake area are of high quality and will serve their intended purpose.

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File No: 12 404 718
Region(s): SS

Licence No: 14983
Location: The survey will be flown in an area 230 km from the Łutsel K'eDene First Nation, 305 km from the Deninu K'ue First Nation, and 215 km from the Smith's Landing and Salt River First Nation locations

South Rae, NWT aeromagnetic survey
No research was conducted under this licence in 2011.

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File No: 12 404 734
Region(s): SA, DC

Licence No: 14845
Location: Mackenzie Mountains - the Backbone Ranges and the Redstone Plateau, Coates Lake; Fortress Mountain; Ten Stone Range

Geology of the Redstone Copperbelt

Four weeks were spent in the field around Coates Lake in the Central Mackenzie Mountains. Detailed geological mapping was carried out, to support ongoing research and thesis work at the University of British Columbia (UBC), Vancouver, B.C. This was the final field season for the project and the field work has provided a wealth of information, regarding copper mineralization in the Mackenzie Mountains.

Further laboratory studies will continue at UBC and the results will be written up as a doctoral thesis. Initial results of the field studies have furthered scientific understanding of how copper is transported and concentrated in certain areas of the Earth. These results can be used to increase the efficiency of mineral exploration projects in the NWT and also in other parts of the world where similar geological environments can be found, for example: central Africa, Poland, eastern Russia and Afghanistan.

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File No: 12 404 759
Region(s): GW,NS
Licence No: 14979
Location: Point Lake; Russell Lake; Damoti Lake; Bell Lake; Rapitan; Yellowknife

Investigating the influence of Archean seawater composition on the evolution and diversity of microbial metallo-enzyme evolution, through the chemistry of Archean banded iron formation

The objective of this research project is to examine the chemistry of the oceans directly preceding the oxidation of our atmosphere at ca. 2.4 billion years ago (The Great Oxidation Event), by studying recently-discovered Neoarchean (2.8 to 2.6 GA) banded iron formation (BIF) in the Northwest Territories. In August (2010), we explored these units for the first time and took transects of the sampling areas and a number of samples for petrographic and chemical analyses. In 2011, analyses determined the stratigraphic, initial petrographic and geochemical framework needed in order to conduct detailed geochemical analytical work that will be completed in 2012. Sampling sites included the ca. 2.62 billion year old BIF at Point Lake, which are interbedded with greywacke-mudstone turbidites, the ca. 2.85 billion year old BIF in the Central Slave Cover Group ~30 km north of Yellowknife, and detailed sampling of BIF belonging to the Central Slave Cover Group at the Northwest Territories Geoscience Office (NTGO) core lab. Thin sections for petrographic and chemical analyses have been made of these samples and chemical analyses are underway.

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File No: 12 404 766
Region(s): NS
Licence No: 14907
Location: Lac de Gras

Diavik aquatic effects monitoring program 2011

Network program stations indicated an "early warning" or "low level" effect on water chemistry within Lac de Gras resulting from the mine.

•Analysis of benthic invertebrates indicated a range of effect designations. Effects on Procladius sp. density and percent Chironomidae were classified as "early warning" or "low level"; the effect on total benthic invertebrate density was classified as a "moderate", and the effect on Heterotrissocladius sp. density was classified as a "high" level effect. Overall, benthic invertebrate monitoring results indicate mild nutrient enrichment.

•Results of a study to examine changes in the amount, number and types of tiny animals (zooplankton) and algae (phytoplankton) that live in the water of Lac de Gras indicate a pattern consistent with nutrient enrichment from the mine, similar to eutrophication indicators, measured as part of the aquatic effects monitoring program. Phytoplankton and total phosphorus measurements in the near-field area resulted in a "moderate" level effect designation while higher zooplankton biomass near the effluent resulted in a "high" level effect designation.

•Results of the lake trout study suggest that there has been an increase in mercury in the muscle tissue of lake trout, in both Lac de Gras and Lac du Sauvage, since 2005. The increase from baseline resulted in a "low" level effect designation. However, since the increase was observed in both lakes, it cannot be directly linked to the mine.

•The weight-of-evidence analysis confirmed the nutrient enrichment effect and concluded that there is strong evidence for a mild increase in lake productivity as a result of nutrient increases in Lac de Gras. There is some evidence suggesting potential low-level toxicological impairment of the benthic invertebrate community, although these findings have high uncertainty, because the link to contaminant exposure is not strong and the responses indicating possible impairment are not consistent with the multiple other responses indicating enrichment.

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File No: 12 404 736
Region(s): SS
Licence No: 14948
Location: Blachford Lake Intrusive Suite of rocks, centered on Thor Lake, about 100 km southeast of Yellowknife

Petrogenesis of the Blachford Lake intrusive suite

Work completed during 2010-2011 involved processing samples collected during the 2010 field season. The samples were divided into two portions, one part was crushed and powdered for analysis to determine composition, and the other was used to determine mineralogy. A geochronological study was also initiated to determine the age of the Thor Lake syenite, a phase in the Blachford Lake intrusive suite, which has some historic controversy. The previous date of this unit was almost 100 million years (Ma) younger than the rest of the units of the Blachford Lake Intrusive Suite, far beyond what was expected and analytical error. Based on our study, we have shown the previous date to be incorrect.

Field work, during the summer of 2011, consisted of sampling carbonate bearing dykes along the shore of the Hearne Channel, Great Slave Lake. These dykes were sampled to determine if they had a relationship to the sedimentary rocks on the south-side of the channel, or to the Blachford Lake Complex; geochemical results which are currently pending will be used to distinguish. Rock sampling was also done on diamond drill holes provided by Avalon Rare Metals Inc. These drill holes intersected unusual rock types that were not encountered surface sampling, during the 2009 and 2010 field seasons. These new rock types are extremely rare and may have serious implications to how the Blatchford Lake intrusive suite formed.

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Region(s): NS
Licence No: 14936
Location: Yellowknife, Aurora College

Sunphotometer measurements at Yellowknife

Measurements of aerosol optical depth (AOD), which is an indicator of the vertical concentration of aerosols, as well as their size, were acquired in Yellowknife, at the AEROCAN sunphotometry network, from Jan. 19 to Sept. 13, 2011. We have not had time to analyze these data, in general, but we did look at some events in detail. The sunphotometer captured the extraordinarily intense smoke (sub-micron aerosol) event at Yellowknife on May 16, 2011, which could be attributed to the fires of northern Alberta. See the Rapidfire image at http://rapidfire.sci.gsfc.nasa.gov/cgi-bin/imagery/single.cgi?image=Canada.A2011136.1840.2km.jpg

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File No: 12 404 772
Region(s): SA,DC
Licence No: 14941
Location: Howards Pass deposit ;
Prairie Creek deposit;
Gayna River deposit ;
Various sites within the central Mackenzie Mountains

Hydrothermal event recognition and vectoring to SEDEX ore system in shale basins, Yukon and NWT

Rocks are made of various components and occasionally they have metals in them. We want to find a way to 1) identify some proximal (close) and distal (at a distance) mineralogical and chemical elements, that will indicate that rocks in a sedimentary basin are likely or not likely to be rich in metals; and 2) understand how metals were emplaced in rocks, and how they disperse in the soils and water once the rocks are weathered. This has implications for the land, environment and mineral identification.

To achieve the objectives mentioned above, preliminary field work was done during 3 weeks in July and August 2011, and will continue during the summers of 2012 to 2014.

The field work consisted of familiarizing ourselves with the regional and basin-scale geology; and collecting representative small samples from drill holes stored at one exploration site (i.e., Howards Pass deposit).

The samples will be subsequently analyzed in laboratories, using various techniques, to help define the mineral and chemical composition of the rocks. Analysis will start in the fall of 2011, and will continue over the next few years. Microanalytical methods for in-situ measurement of trace elements of mineral phases (apatite, pyrite, feldspar etc.) within host-, footwall, and hanging wall sedimentary rocks will be developed.

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File No: 12 404 742
Region(s): IN
Licence No: 14839
Location: The shelf edge, from the US/Canada border to the vicinity of Banks Island

Assessment of the western Arctic boundary current

Cruise HLY1103 of the US Coast Guard Cutter Healy took place from 2-27 October, 2011. The title of the field program is "Assessing the western Arctic boundary current and its role in the arctic ecosystem and climate change", funded by the US National Science Foundation as part of the Arctic Observing Network (AON). The project is a collaboration between US and Canadian scientists. We are using a combination of year-round subsurface moorings in the boundary current (deployed upstream in US waters), and seasonal (summertime) shipboard observations, including measurements downstream in Canadian waters. During cruise HLY1103, we successfully deployed all of the moorings, and carried out a hydrographic survey of the boundary current from Barrow Canyon, along the continental slope into Canadian waters to the mouth of M'Clure Strait. The survey consisted of 10 cross-slope transects, using a conductivity/temperature/depth (CTD) package equipped with a transmissometer, fluorometer, and oxygen sensor. Niskin bottles were used for water sample measurements of salinity, dissolved oxygen, nutrients, dissolved inorganic carbon, total alkalinity, oxygen isotopes, and chlorophyll. Velocity measurements were made using the hull-mounted acoustic Doppler current profiler (ADCP).

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File No: 12 404 640
Region(s): IN, GW
Licence No: 14908
Location: Blueberry site, north of Inuvik from Noel Lake towards Swimming Point; the Dead Zone in the outer Mackenzie Delta; the Kendall Island Bird Sanctuary; Richards Island; lakes north of Fort McPherson, on the western edge of the Mackenzie Delta

Examining the impacts of climate change on aquatic and terrestrial ecosystems of the Mackenzie region, NWT

In 2011, we collected sediment from the bottom of lakes near Noel Lake, Husky Lake, north of Fort McPherson, and ~60 km west of Swimming Point. Our objectives are to document the impacts of changing climate on these lakes, especially the impact of thawing permafrost and storm surges. This summer we visited ~10 lakes, to study how algae and insects preserved in the sediment are being affected by these disturbances. Early results of the storm surge project indicate that larger storm surges occur during periods of warmer temperatures, suggesting climate warming may result in more and larger storm surges near the coast. Around Fort McPherson we sampled a lake near Husky Lake with a small stream flowing into it from the mountains. Up in the mountains the permafrost has melted and the ground is collapsing and is being carried by the stream into the lake. In April, we collected sediment from this lake and found that ~20 cm of sediment had been deposited in this lake during the last 10 years, which is a remarkable amount of sediment! In other lakes around Inuvik, it would usually take more than 100 years to accumulate this much sediment.

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File No: 12 404 570
Region(s): DC

Licence No: 14874
Location: The Scotty Creek drainage area, approximately 62 km SSW of Fort Simpson

Understanding and prediction of permafrost thaw impacts on northern water resources

Research at Scotty Creek is focused on 1) understanding the rates and patterns of permafrost thaw, and the physical and biological processes that control it; 2) developing science-based tools to predict the rate and pattern of permafrost thaw over the next 50 years; 3) understanding and predicting the impact of permafrost thaw on ecosystems and water resources; and 4) developing appropriate mitigation strategies. Scotty Creek is typical of the southern margin of permafrost, where permafrost is relatively warm, thin and discontinuous. As a result, permafrost thaw often leads to permafrost disappearance. Over the last half century, permafrost has reduced from about 72% of Scotty Creek to about 40%, and the rate of permafrost disappearance is accelerating. Current research is focused on 1) developing new conceptual and mathematical models that simulate water flow and storage processes at the southern margin of permafrost, 2) developing a new permafrost thaw model that includes the effects of climate warming and human-induced disturbances, such as seismic lines, winter roads and pipelines; and 3) coupling the hydrological model with the permafrost model, to predict the spatial distribution of permafrost and river flow regimes under possible scenarios of climate change and human-induced disturbances. This project hosted a public workshop in Yellowknife (Oct., 2011), that focused on interactive training of new science-based predictive tools, needed to properly manage northern water resources in the wetland-dominated regions with thawing, discontinuous permafrost. This project is part of the new Laurier-GNWT Partnership, and as such collaborates closely with the GNWT and its federal partners, NGOs, First Nations communities and local stake-holders, for the purpose of strengthening the NWT Water Strategy.

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File No: 12 404 745 **Licence No:** 14857
Region(s): IN **Location:** Darnley Bay Resources land holdings near Paulatuk

Darnley Bay Resources Ltd. 2010 - 2012 field program

This summary covers the second year of a three-year program of exploration for metals and diamonds in the Paulatuk area. The following field work took place in November 2010 and March-April 2011:

- Geological Prospecting and Sampling was not carried out, due to snow cover.
- Claim Staking and Bathymetric Survey was not carried out during the second year.
- Ground Geophysical Surveys were not carried out during the second year.
- Kimberlite/Metals Drilling was not carried out during the second year.

Results of the drilling in 2010 were received in early 2011 and announced. Three new kimberlite pipes were intersected on the Parry Peninsula, one contained diamonds and numerous indicator minerals. The other two did not have enough kimberlite material for analysis. In addition, xenoliths were extracted from the kimberlite core, for a research project currently underway at the University of Alberta and the Northwest Territories Geoscience Office, focused on mantle studies.

The third drillhole for metals was completed in 2010, south of Paulatuk. The hole on a gravity target was terminated after 158 m of overburden (glacial till and unconsolidated Cretaceous sediments) and 84 m of Devonian vuggy dolomite, due to technical difficulties. The same target was drilled again in 2011, but encountered the same difficulties and was terminated at a depth of 242 m, without reaching its target.

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File No: 12 404 775 **Licence No:** 14951
Region(s): SA **Location:** Powell Creek; Shortcut Creek; Little Chicago

Western Imperial formation

Plans were changed, due to circumstances in the field. Rather than multiple days and sites, we visited a single location on one day, July 27 2011. The location was Lac Charrue, approximately 50 km northeast of Little Chicago. Samples were collected for detrital zircon analysis.

Detrital zircon analysis of other sandstones in the northern Mackenzie Valley had shown that the sandstone rocks contained sand grains that were initially from either northwestern Alaska or Siberia. Those sand grains were transported from those locations to the northern Mackenzie Valley area, approximately 360 million years ago, when those landmasses were located where the Arctic Ocean is presently located. We aim to improve our understanding of how NW Alaska and Siberia drifted away from northern Canada, during the formation of the Arctic Ocean.

Sandstones collected under this research licence were crushed, to separate individual sand grains for analysis. We did identify Alaskan and Siberian sand grains and we will publish those results in a scientific journal.

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File No: 12 404 765
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Region(s): NS,SS
Location: MacKay Lake and Beaverhill Lake

Heavy mineral indicator tracing in glacial-fluvial systems
No research was conducted under this licence in 2011.

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Region(s): SA,DC
Location: Coates Lake deposit ; Bear Twit deposit; Prairie Creek deposit; Howards Pass deposit ; Mactung deposit

Geochemical and mineralogical controls on metal dispersal downstream of mineralization in the Mackenzie Mountains, Canada
In July and August of 2011, sampling was done in, and around, the Prairie Creek Mine site. Water and sediment (very fine grained, as well as larger grained) was sampled from the streams. Water and sediment (only fine grained) was also sampled from within the ore stock pile and waste rock pile on site. Over the past year, these samples have been analyzed, using a variety of different methods. Chemical analysis was done for total concentrations of major and trace elements in the water and sediments. The sediments have also been analyzed under a Scanning Electron Microscope and by synchrotron-based techniques, both of which allow the investigator to look at individual grains, to get chemical data for specific spots on those grains, and to figure out which minerals the grains contain. Results from all analyses are still being processed and interpreted. Preliminary results show that there is chemical weathering occurring and that dissolved trace metals are found in very small quantities in the streams. They are often adsorbed onto iron-containing grains and clays. In the ore stock pile and waste rock pile, metals are found in higher concentrations. Modeling software will be used to try to predict the movement of these metals.

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File No: 12 404 657
Region(s): IN, GW, SA, DC

Licence No: 14918
Location: Jean Marie River; Fort Simpson; Wrigley; Tulit'a; Norman Wells; Fort Good Hope; Tsiigehtchic; Tuktoyaktuk and locations surrounding these communities

Permafrost monitoring and collection of baseline terrain information in the Mackenzie Valley corridor, NWT

Permafrost monitoring sites throughout the Mackenzie corridor (Inuvialuit, Gwich'in, Sahtu, DehCho regions) were visited in August and September 2011, to acquire ground temperature and active layer data. Two students and an Inuvik resident were engaged through ARI, to assist with data collection in the Inuvialuit and Gwich'in regions. Data records for 40 monitoring sites established in 2007-2008 were extended, to better characterize the permafrost conditions. These records are helping us understand the natural variability in permafrost thermal and active layer conditions and ensure availability of adequate baseline permafrost information to support land management decisions in the region. Our results show that permafrost in the discontinuous permafrost zone, which covers a large portion of the corridor, is generally warmer than −2°C. Permafrost temperatures generally continue to increase and ongoing maintenance of monitoring sites and data collection is planned to better characterize the impact of climate change on the permafrost environment. A detailed report, including graphical and tabular summaries of data, is currently being prepared and will be sent to relevant organizations in the region.

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File No: 12 404 548
Region(s): SA, NS, SS

Licence No: 14855
Location: Castor lake; Gamètì airport; Hepburn Lake; Sulky Lake; Lac des Bois; Simpson Lake; Colville Lake; Kugluktuk

Teleseismic studies in the Wopmay

During 2011, nine seismic stations were removed in the East Arm regions of Great Slave Lake; one remains. One new station was sited on Johnson Point, Banks Island. Seven stations were maintained in the northern Great Bear Lake region, as well as on southern Victoria Island. This project is attempting to define the northwest margin of the Achaean Slave block at great depth, in support of diamond exploration. All active stations successfully recorded more than 100 distant earthquakes, in 2011. Analysis of the final data from the East Arm suggests that mantle rocks, associated with the Slave block, to the northwest, form a wedge of mantle rock that continues as far south as Gardenia Lake at 170 km depth.

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Region(s): IN, GW **Location:** Inuvik

PolarDARN: The northern hemisphere polar portion of the international SuperDARN [Super Dual Auroral Radar Network] program

The most important achievement in the past year is the successful construction and installation of a new digital beam forming (DDS) system. The system was installed at Inuvik, on a site visit, from 29 November - 3 December 2010.

The Inuvik radar is a world-class facility for ionospheric monitoring. When a DDS system is deployed at Rankin Inlet, as well as at the other two Canadian-operated auroral-zone SuperDARN radars near Prince George and Saskatoon, by the end of 2011, we will be able to perform more complicated/useful scanning programs than the other 23 radars in the network.

The PolarDARN radars are positioned in the polar cap region, which is highly dynamical and is directly controlled by space weather conditions in near-Earth space. The polar caps are the regions that contain those magnetic field lines that are connected directly between the Earth and the interplanetary medium. It is by studying the direct interaction between the interplanetary medium and the Earth's upper atmosphere that we can begin to understand the influences that phenomena like solar storms have to communications, satellites, astronauts, large power grids at ground level, and the influence of space weather upon weather at the Earth's surface.

The PolarDARN radars will be located and orientated so that they will provide the opportunity for research collaboration with the "incoherent scatter radar" (ISR) radar project happening in Nunavut. They will also enhance the ability to do HF radio wave propagation experiments in the polar cap region. For the times when HF radio wave transmission is the only viable communication option for aircraft in the polar regions, understanding the propagation of these waves will be very important.

It has clearly been a very busy and productive year for the Inuvik radar team, and the future promises to hold even greater research and collaboration opportunities.

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File No: 12 404 535 **Licence No:** 14920
Region(s): NS **Location:** The Baker Creek basin

Investigations of the water cycle and hydrological processes of the subarctic Canadian Shield

Field activities in 2011 in the Baker Creek research catchment began with spring snow surveys and the activation of climate towers and water level stations in April. There were no people living and working in the research catchment in 2010. Along with the continued remote measurements of meteorological conditions, evaporation, soil moisture and stream flow, a hydrochemistry sampling program, began in 2010, continued through 2011. This program involved sampling stream flow in tributaries and at lake outlets along Baker Creek bi-weekly. Groundwater was also sampled. Samples were analyzed for ions, pH, metals, nutrients and carbon and nitrogen. This work is in support of determining how stream chemistry and frozen ground relate to wetter autumn conditions during freeze up. These research questions are in response to observations, which have shown that stream flow in small subarctic Canadian Shield catchments changed from a predominantly nival (snowmelt) to a combined nival/pluvial (snowmelt and rainfall) regime in the late 1990's. The autumn of 2011 was wet and the 2011 annual peak discharge was in October, rather than during spring snowmelt. Hydrochemistry and stream flow data during this freeze-up event were collected and are now being analyzed.

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File No: 12 404 757
Region(s): IN
Licence No: 14915
Location: Southern Beaufort Sea

UpTempO: measuring the upper ocean temperature of the Arctic Ocean

One UpTempO buoy was deployed from the Canadian Coast Guard ship Amundsen, in August 2011. The ocean thermistors on the buoy failed immediately. A second buoy was deployed later that same month and this one worked successfully. As expected, it drifted with the prevailing currents westward through the southern Beaufort Sea, measuring the fall cooling of the upper ocean. The buoy failed in late October 2011, probably as a result of sea ice impact.

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File No: 12 404 776
Region(s): DC
Licence No: 14955
Location: Streams and rivers along the Mackenzie Highway from the Alberta border until it meets the Liard Highway near Fort Simpson

Composition of natural dissolved organic carbon in streams along latitudinal transect

In August 2011, we sampled 65 rivers in NWT and northern Alberta, during a 3 day road trip, taking 2x50 ml whole water samples at each river. The purpose was to assess the composition of dissolved organic carbon for rivers within and outside the permafrost region. Sampling was successful and analysis back in Guelph, Ontario, was also successful. We found that the aromaticity of dissolved organic carbon decreased with latitude of the sampling river, however, we are still looking into possible explanations for this pattern. Aromaticity of dissolved organic carbon regulates how well it supports microbial respiration, but also how well UV-light is attenuated. Possible explanation include the presence or absence of permafrost, extent of peat lands along the transect, differences in water temperature, or differences in how much groundwater that enters the rivers.

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File No: 12 404 741
Region(s): IN,GW,DC,NS,

Licence No: 14856
Location: Inuvik; Paulatuk; Ulukhaktok; Tsiigehtchic Fort Providence and Rae

Arctic wastewater research

From May to October of 2011, Environment Canada conducted sampling at wastewater systems in Canada's Arctic region for the third year. Extensive sampling was conducted at the lagoons in Paulatuk, Inuvik, Tsiigehtchic, and Rae. Environment Canada also visited Ulukhaktok, to remove thermistors that were placed in the wastewater lagoon the year prior.

The sewage lagoons in Paulatuk, Inuvik and Tsiigehtchic discharge continuously, during the open-water season. Sampling was done in these communities in June. Paulatuk and Inuvik were also sampled in September. A controlled discharge of Rae's sewage lagoon began in August and samples were collected throughout the discharge. At each community, samples were taken of raw sewage (influent), lagoon effluent and sludge. Samples were also taken of the overland flow (wetland) prior to the receiving environment.

Solids in the Paulatuk and Inuvik lagoon effluent were lower in June than in September. Higher solids are expected in the fall, because algae are discharged with the effluent. Solids concentrations were high in Rae (>50mg/L), due to sediment flowing through the discharge pipe. In most cases, solids concentrations were reduced by >90% through the lagoon. Removal of organics through the lagoon systems was similar.

The results show that wetlands also contribute to the overall treatment of the wastewater. In most cases, wetland treatment reduced solids and organic concentrations by an additional 20% from the lagoon effluent.

Community reports containing detailed data will be sent to the ARI and the communities by November 30, 2011. In 2012, Environment Canada plans to return to Paulatuk and Rae. New sites will likely include Edzo, Fort Providence and Tuktoyaktuk, funding permitting.

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File No: 12 404 764 **Licence No:** 14900
Region(s): IN,GW **Location:** Mackenzie River Delta

Deltaic lake sediments as recorders of past carbon export from arctic river drainage basins

The Mackenzie River is the largest source of river sediments and carbon to the Arctic Ocean. Its delta, the Mackenzie Delta, is the second largest river delta in the world, and is covered with thousands of small, shallow lakes. During the period of ice break-up in May-June, when water levels are high, these lakes receive and store a lot of river sediments.

To determine the spatial spread of sediment delivery to the delta, samples were collected from six lakes and delta channels all across the Mackenzie Delta. In addition, sediments were collected from the Mackenzie main channel. Sampling was performed from helicopter floats, on June 3rd 2011. The sampling results are still being processed, but preliminary results show that lakes in the western part of the delta show a different sediment pattern than in the eastern and northern part of the delta. This can probably be explained by the inflow of the Peel River, draining into the Mackenzie Delta in the southeast. If river discharge and/or the timing of the ice break-up changes due to climate change, this will most likely also change the sediment distribution into the delta lakes.

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File No: 12 404 740 **Licence No:** 14838
Region(s): IN **Location:** Mackenzie River, near Inuvik

Towards long-term monitoring of the CO_2 system in arctic rivers

This year, we have continued to collect monthly river samples from Mackenzie River, near Inuvik, NT, Canada. All sampling was very successful. We have collected a total of 18 water samples. All samples will be measured for total dissolved inorganic carbon (DIC) concentration and alkalinity. About half of the samples have been processed, and the results are promising. We will continue processing the samples, and maintain monthly sampling into 2012. The available data show significant seasonal changes in DIC concentrations and alkalinity in the east channel of Mackenzie River at the Inuvik dock. From DIC concentrations and alkalinity, we can calculate pH and partial pressure of carbon dioxide (pCO2) in water. The results also show large seasonal changes of pH and pCO2. We also found that there is a significant positive correlation between monthly DIC or alkalinity concentration and mean basin-wide temperature: higher temperature, higher DIC or alkalinity concentration in Mackenzie River water. We are in the process of data analysis and developing a manuscript that describes carbonate chemistry in the Mackenzie River basin.

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File No: 12 404 549
Region(s): NS

Licence No: 14854
Location: West of Yellowknife; along the Ingraham Trail, east of Yellowknife; the Baker Creek Watershed, north of Yellowknife; along the Tibbit to Contwoyto winter road, based out of the Lockhart and Lac de Gras facilities

North Slave permafrost study: Characterizing and predicting discontinuous permafrost for climate change adaptation

Field work was conducted between June and September, 2011, in the Great Slave region, along Highways 3 and 4, and the Tibbitt to Contwoyto winter road. Permafrost cores, ranging from 1.2 to 7.3 meter depth, were obtained from six sites in peatland, spruce and birch forest settings. Thaw depths, soil types, visible ice moisture contents, and bulk densities were determined, with grain size, water geochemistry and geotechnical tests to be determined. These data will be used as part of a graduate thesis study and for understanding geotechnical conditions associated with permafrost soils in the area. Temperature data continue to be collected and monitored at a number of sites including: active layer temperatures from birch, spruce forest and peatland sites; ground temperatures from burn sites and peatland, birch and spruce forest sites; and air temperature sites; shallow-water; and lake-bottom sites. These data are used to understand potential climatic gradients and the effects of water on local permafrost conditions. PCSP-supported helicopter surveys were undertaken, to validate remote sensing interpretations of surficial geology and vegetation cover mapping in NTS map sheets 85I, J, O and P, 86A and 75M.

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File No: 12 404 760
Region(s): NS

Licence No: 14871
Location: NWT Power Corporation's Frank Channel Substation, located near Behchokò

High-precision atmospheric carbon dioxide and methane measurements at Behchokò, NWT

Environment Canada conducts atmospheric measurements of carbon dioxide, methane and other GHGs, from coastal, interior and arctic regions in Canada. Our goal is to provide high quality data, to permit and improve our ability estimate sources, such as carbon dioxide, from the burning of oil and gas, as well as natural sources, such as methane emissions, from wetlands. Of particular interest, and thus the reason behind the measurement program at Behchokò, is in regards to the general concern that the Arctic may undergo drastic changes, if the arctic warming trend continues. This is especially true for methane, since arctic methane sources may be widespread. The climate feedbacks from such changes may potentially be very large. Because Behchokò is located in a discontinuous permafrost zone, and within the tree line transition zone, this site provides an excellent platform for observing potential emissions of carbon dioxide and methane from the high terrestrial and subarctic region. The data records are too short to make any conclusive statements at this time, but we are confident that these records will be invaluable, if significant emissions of methane and carbon dioxide from the subarctic do start to occur.

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Licence No: 14947
Location: Noell Lake

Noell Lake ice study - hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

The objective of this research is to improve knowledge on lake ice and its effect on the food webs/productivity of small arctic lake systems, in order to better predict changes that could occur under changing climate. In late-September 2010, prior to freeze-up, an automated ice buoy and subsurface mooring system was deployed in Noell Lake, for continuous monitoring of weather conditions, lake ice cover (i.e., formation, growth over winter, breakup in spring), light penetration into the lake through ice in winter, and water quality. The installation was successful and data was collected by the system, throughout the 2010-11 winter. In late June/early July 2011, after the ice was gone, the buoy and mooring system was removed from the lake for servicing. Due to some logistical challenges, the monitoring system was not in place to capture the first part of the summer season. In September, the buoy system was redeployed and it is expected that the system will provide continuous data (winter, spring, summer and fall), in 2011-12, from Noell Lake. These data are allowing us to examine lake ice and its effects on the food web/productivity through the winter, as well as the character of food webs/productivity during the ice-free season.

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File No: 12 404 711
Region(s): IN
Licence No: 14832
Location: Mackenzie Delta Lakes

Amendment - Hydro-ecological responses of arctic tundra lakes to climate change and landscape perturbation

Through our on-going investigations on small Arctic ponds/lakes, it became evident that some of the small pond/lake food-webs may include very small fish, such as stickleback and pond smelt, as top-down controls on the food-web. In 2009, this research component was added to our overall research program, to determine if any of the small ponds/lakes we study contain fish. It was found that 7 of the 11 lakes visited did indeed host fish. In 2010, we visited some of these lakes again, to collect additional samples of some species of fish and increase our overall sample size. We also visited 15 "new" ponds/lakes, not sampled in 2009, that drain into Noell Lake, to enhance our investigations. Although we were licensed to do so, it was decided that we did not need additional information on fish, and no fish collections were taken in 2011. All our information on fish, including which fish types were found in which lakes and which lakes did not host fish, are being made available as a DFO Data Report.

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Location: Mackenzie Delta Lakes

Hydro-ecological responses of arctic tundra Lakes to climate change and landscape perturbation
An overall goal of this work is to better understand the effects of changing climate, using permafrost degradation as an analogue for changes under a warming climate, on the supply of nutrients to tundra lakes, and in turn, its effect on lake geochemistry, as well as the biological communities within the lakes. Preliminary results indicate that the high inter-annual and seasonal variability in temperature controls key hydrological processes, such as ice-on and ice-off dates and the timing of the spring snow melt. Additionally, inter-annual variability in snowfall and rainfall has significant controlling effects on the magnitude of the spring snow melt and summer surface flow generation, respectively. This apparent variability in both climate and hydrology affects the geochemistry of both surface flow and lake water. Most noticeable, in spring, when snow melt water has relatively low ionic concentrations, there is a dilution effect on surface flows into the lakes, and in turn, the lake water. However, runoff from shoreline permafrost slumps exhibit relatively high concentrations of ions than from other catchment sources, and contributes to relatively higher concentrations in the lake water. Data analyses, interpretation of results, and assessment of potential effects on aquatic biology (food-webs) is ongoing.

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Region(s): NS **Location:** Yellowknife; Behchokò

Housing and being homeless in Yellowknife
This research project began in 2009, and thus far has resulted in three publications. They are as follows:

1. A 2010 article, co-authored by Frances Abele, Nick Falvo and Arlene Hache: http://homelesshub.ca/%28S%2820gliz35wmmqflb1dxypfz45%29%29/Library/Homeless-in-the-Homeland--A-Growing-Problem-For-Indigenous-People-in-Canadas-North-49863.aspx

2. A 2011 policy report on homelessness, written by Nick Falvo, in partnership with the Centre for Northern Families: www.homelesshub.ca/Yellowknife

3. A 2011 peer-reviewed chapter on government-assisted housing in the NWT, which appeared in How Ottawa Spends (McGill-Queen's University Press): www.homelesshub.ca/NWT

Dr. Abele and Mr. Falvo still intend to collaborate on an historical article on government-assisted housing in the NWT. It would focus on the period from roughly 1945 to 2000.

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Region(s): IN, NS **Location:** Inuvik; Yellowknife; Tuktoyaktuk

The impact of the priest decline on the Canadian Roman Catholic Church
This doctoral dissertation examines the impact of the decline in the number of priests within the Canadian Roman Catholic Church. Part of this project examines the priest shortages that exist in remote areas in northern Canada. Interviews with Roman Catholic activists reveal that many Canadian parishes are experiencing a shortage of priests. There are reports that some Roman Catholic communities in the north may only see a priest once or twice per year and that Roman Catholic lay persons are attending to the spiritual needs of parishioners. As well, some northern priests must cover multiple parishes. These priests spend a great deal of time travelling between parishes to administer sacraments requested by northern Roman Catholics. The next phase of this project will take place at the Diocese of Mackenzie-Fort Smith. We will gather qualitative data on the lived experiences of northern Roman Catholics as they develop what they refer to as “a new way of being church” that no longer depends on priests from the south. Data will be collected through interviews with the Diocese administrators, as well as people that are involved in Roman Catholic lay ministry. This research is a valuable addition to the sociological

literature as it will improve our grasp of the constituency of the Canadian Roman Catholic Church. It is imperative to include the voices of northern Roman Catholics in any study of the Canadian Roman Catholic Church. Additionally, northern Roman Catholics have had an effect upon the Roman Catholic Church due to both their challenges and their innovations. This study will provide us with specific knowledge about the unique features of northern Roman Catholic practice, which is increasingly focused upon aboriginal leadership.

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Location: Yellowknife

Quality workplace environment
Quality workplace environments are known to be a positive determinant in the recruitment and retention of nurse educators.

This project is designed to survey nurse educators in all public post-secondary schools of nursing in British Columbia (BC) and the Northwest Territories (NT) to establish what nurse educators consider to be important elements in their work environment and to determine if these are experienced. This project builds on a pilot project (H08-0021), which involves the development of an instrument to measure quality workplace environments, as well as the pilot testing of that instrument. This instrument was used in all of the surveys. All nurse educators in public post-secondary schools of nursing in BC and NT were invited to participate in an online survey. Using a mixed methods approach, descriptive statistics will be used to examine the survey responses. Qualitative responses will be examined for themes and used to triangulate the statistical findings. This work is ongoing.

Next Steps: We have proposed an amendment to collect data through focus groups with nurse educators in BC and NT. In the survey, subjects had time and space restrictions on their qualitative comments. Focus groups will help to further inform the themes emerging from the qualitative data. We are planning 4 to 8 focus groups that will involve all nurse educators currently employed in public post-secondary education institutions in BC and NT. This will include nurse educators teaching in programs ranging from Health Care Assistant Certificates to Doctoral Programs.

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Region(s): SA
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Location: Tulít'a

Traditional and market food: focus on fish consumption in Tulít'a, NWT

In June 2010, the community of Tulít'a raised concerns about a public health advisory to eat less lake trout from Kelly Lake due to high levels of mercury measured in them. The community requested a study to learn if the fish they were eating could harm them, while also keeping in mind the nutritional and cultural benefits of fish. Sixty-seven community members took part in the study, twelve were children. Participants gave a hair sample for mercury testing and answered questions about their fish eating habits. Seven community knowledge holders and a public health officer gave interviews on the cultural meaning of fish as a traditional food, as well as the effects of the advisory on how people view eating fish. Hair mercury tests showed that people were consuming very low amounts of mercury. Only two adult men required follow-up. Dietary results show that people eat more fish in summer than winter. Whitefish and lake trout are eaten most often, but grayling, loche, inconnu and cisco are eaten too. Fish provides important nutrients. Interviews noted that traditionally fish was a dependable food source, ensured the survival of the Dene & Métis peoples, and is also deeply culturally important. Fish is still preferred as a food today and traditional food harvesting needs to continue. Negative reaction to the public health advisory on mercury was largely due to the way information reached the community. This study has changed the way public health advisories are done in the Northwest Territories.

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Licence No: 14933
Location: Yellowknife

Street outreach community consultation

The purpose of this study was to describe the health and addictions assets in the downtown core of Yellowknife, NT, in order to better address the high hepatitis C (HCV) and sexually transmitted infection (STI) rates observed there, especially infections transmitted through illicit drug use.

Over the summer of 2011, data was collected through focus groups with nineteen street people, a Photovoice workshop with eight street people and seven one-on-one interviews with service providers in the downtown core. A number of themes emerged through the consultation process, including:

- Needle exchange;
- non-beverage alcohol use;
- mixed messages to youth;
- sex trade;
- interagency coordination; and
- need for outreach services.

The community consultation results indicate that the high HCV and STI rates are likely not related to illicit drug use, such as transmission by crack cocaine pipes. However, links may be found through further investigation into the following areas:

- The development of harm reduction mechanisms that address the needs of the street population;
- Non-beverage alcohol use and how it impacts the HCV and/or STI rates in Yellowknife;
- Youth-based social marketing tools that use messaging consistent with local laws and/or policy;

- How the sex trade in Yellowknife can be effectively addressed;
- How communication, coordination and collaboration can be increased between service providers and service agencies in Yellowknife; and
- Defining the appropriate outreach measures to reach Yellowknife's marginalized street population.

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Location: Ndilo; Dettah

The effects of a changed climate and environment on the nutrition and health of Dene First Nations
No research was conducted under this licence in 2011.

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Region(s): DC, NS, SS
Location: Courageous Lake

Courageous Lake project - Social and economic sciences research
The objective of this study is to characterize the social and economic environment of the proposed Courageous Lake Project and land use in the area.

The 2011 environmental baseline program collected data from various government, academic and other public sources to characterize the social and economic environment of the proposed Courageous Lake Project. Contact with various First Nations and the Métis was initiated to discuss research methodology, but due to various delays no survey work was completed. Meetings are anticipated to occur in November.

A desk-based portion of the study compiled information from available sources, including government databases regarding existing land use activities to help identify land users and tenure holders, including commercial and recreational land users, as well as aboriginal groups. The land management context for the study area was investigated, including the identification of relevant land/resource management strategies and objectives.

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Region(s): SS
Location: Fort Resolution

Linking place identity, environmental change and adaptation in the context of changing water conditions in Fort Resolution, NT

Preliminary findings show that water in/around Fort Resolution is perceived by community residents to be changing dramatically. Water levels in Great Slave Lake, Slave River and Delta and other important waterways have declined by several inches in the last few years. Residents noted that water looks, tastes and smells different in many traditional areas. Many expressed mistrust of water quality, both on the land and in the community, and take alternate measures for drinking water consumption.

People are connected to places in the South Slave Region because of heritage, what the land provides, a sense of identity, social connections, and for well-being. Many places are now inaccessible due to declining water levels, making it harder for trappers to engage in traditional subsistence activities. Many residents described feelings of loss because places important to them are changing. There is sadness and frustration that people can no longer use the land and water in the same way as before. People expressed frustration that many of the impacts on regional waters are coming from outside the community, and often beyond territorial borders. It is imperative that steps are taken to ensure community concerns about water are heard and addressed appropriately at multiple levels.

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Location: Ulukhaktuk; Aklavik

Success factors for small sustainable drinking water systems

Water is used in the home for cooking, cleaning, bathing and drinking. Everyone needs to have access to safe water in order to be healthy. In most communities in Canada, water is treated and then delivered to homes by a pipe or by truck. Small communities (those with fewer than 5,000 people) often face a number of challenges when providing safe water. These include, but are not limited to, the cost of water treatment and delivery. The purpose of this study is to understand what these challenges are, and to understand how some small communities have overcome these challenges in order to provide safe water. To do this, interviews were conducted with decision-makers, water operators, and community members, in seven communities from across Canada, including one community in the Northwest Territories (Ulukhaktok). The research found that the community had improved their water treatment so they could meet new regulations set by the territory. Although people were happy with their water supply, most preferred to gather water from the land. This information will be used to better understand issues that small communities face with respect to water quality and health.

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Region(s): IN, GW, NS, SS, SA, DC
Licence No: 14988
Location: All communities

Rural and northern community response to intimate partner violence

For the year 2011, the Northwest Territories (NT) team of the Rural and Northern Community Response to Intimate Partner Violence (IPV) accomplished several goals. We successfully hired two undergraduate students from Aurora College as research assistants. One student is from the Nursing Program and the other student is currently enrolled in the Social Work Program. We are very satisfied with their work productivity, learning achievements, and contributions to our project. Furthermore, these students will be retained for the 2012/2013 academic year.

One of our major accomplishments this year was the completion of an environmental scan of supports and resources located throughout the NT (e.g., shelters, victim services, treatment programs, justice system supports/courts, health program, etc.). This data was submitted to the project geographer who will integrate the data into the geographic information system (GIS) mapping. We were also able to establish a relationship with a G Division RCMP member, whose work focuses on domestic violence. He and the national office have helped us collect incidence data across the NT. This will also be integrated into the GIS mapping.

For 2012, we will have a face-to-face project meeting with the entire planning team, representing all 4 jurisdictions (Alberta, Saskatchewan, Manitoba, and Northwest Territories). This will determine the steps for our second year including the completion of GIS mapping, a review of the results, and begin interviews with front-line service providers across the NT who have been identified by our aboriginal project sub-committee as having expertise in IPV (e.g., directors of shelters, justice workers, elders). We are in the process of seeking NT representation on the aboriginal project sub-committee.

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Location: Inuvik

Vocational education and training partnerships in northern Canada

In November, the researcher visited Inuvik for 10 days and interviewed students at Aurora Campus who were taking Aboriginal Skills & Employment Partnership (ASEP) funded trades programs. Stakeholders related to education, training, and employment were also interviewed. A total of 17 interviews occurred at this stage. Follow-up interviews will be carried out in the spring 2011.

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Location: Yellowknife; N'Dilo; Dettah; Behchokò

The Canadian state's relation to Impact and Benefit Agreements in NWT

This research looked at the Canadian state's relation to Impact and Benefit Agreements (IBAs) signed over to the diamond mines in the NWT. Since these agreements are bilateral and take place outside of the regulatory regime within the NWT, it is important to understand better what interests the state has in these agreements.

Interviews were conducted with federal and territorial government officials, leaders within the Akaitcho Treaty 8 First Nations and the Tłı̨chǫ First Nations, consultants, and lawyers. Many of the interviews were conducted in and around Yellowknife.

The research concluded that the Canadian state has been downloading its responsibilities onto third parties through these agreements. Therefore, the state is being relieved of certain elements involved in the consultation and accommodation of potential infringements to aboriginal rights and title. Through abstaining from regulating these agreements, the state has largely given way to the forces of the market to dictate the negotiation, signing, and implementation of these agreements.

It is through these agreements that indigenous communities in Canada can be further incorporated into the capitalist system, through increased participation in the labor market and the emergence and growth of aboriginal-owned and operated businesses. This suits the interests of the state by making these communities more self-reliant.

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Location: All communities

Evaluation of early childhood development training

The evaluation was intended to identify ways to improve the quality of training. Input was gathered from almost 120 early childhood students, practitioners, educators, and leaders in the field. It is clear that tinkering with the existing training program offered by Aurora College is not enough. The GNWT Department of Education, Culture and Employment and Aurora College need to work together to deal with the issues that impact on attracting, retaining, and training northerners for early childhood work. These issues include: low wages and benefits, low value placed on this work, job insecurity, and inequities among early childhood workplaces. The evaluation calls for changes to: existing early childhood training, in terms of expanding delivery modalities; establishing partnerships to deliver accredited training; implementing prior learning assessment and recognition; and linking early childhood, aboriginal language, and teacher education training. The evaluation also recommends a professional early childhood association, occupational standards, credentialing and registering processes, standardized pay structure, and more focus on student supports, promotion, and performance monitoring.

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Region(s): GW
Location: Fort McPherson; Inuvik

Tracing trails with Gwich'in: Poetics, well-being, memory, and land in circumpolar Canada

This Royal Anthropological Institute Urgent Anthropology Fellowship research has illustrated that there is an intimate relation between land, poetics, well-being, and memory. This research has shown that 'language loss' between and within different generations is complex and nuances need to be made. Language revitalization projects need to include such complex dynamics. The programs for language revitalization can be threefold: on the land, in the community with Tukudh Bible classes, and in the community at school and in homes. Taking ownership of the language, like Gwich'in language workers and elders emphasize, will play an integral role in this. With Gwich'in elders passing away, work on the Tsii Deii language remains pivotal. Recording elders singing Gwich'in hymns and reading the Tukudh Bible needs to be continued. Gwich'in people continue to live life out on the land – hunting, fishing, trapping, picking berries and travelling. Large-scale resource extraction developments in the Peel River Watershed have been a matter of great concern to the Gwich'in. These developments could jeopardize life out on the land, and subsequently, the language revitalization, well-being, and memory of the Teetl'it Gwich'in people.

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File No: 12 410 892
Licence No: 14911
Region(s): GW
Location: Fort McPherson

Collaborative research on community well-being

This research on the role of volunteering, sewing, and human-land relationships in community well-being is conducted in collaboration with the community of Fort McPherson and the Gwich'in Social and Cultural Institute. The methodology of this qualitative study involves apprenticing with elders and community members in the three focus areas, conducting life-story and semi-structured interviews, as well as documenting these activities on video. The theme emerging from the first five months of research concerns the balance of the capacity to care for others, either individually or collectively, as expressed in volunteering time and resources, and the capacity to care for oneself as expressed in hunting, snaring, getting wood, sewing, cooking, being physically fit, and pursuing education. The importance of this balance for well-being is recognized more easily while staying on the land. A project collaboration with the youth council using photography for the creation of digital stories and posters to explore the topic of well-being is in the planning stages and will begin in January 2012. The second stage of the project will focus on the recording of life stories, the completion of the youth photo project, and the production of written and visual material for knowledge sharing in the community.

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File No: 12 410 902	**Licence No:** 14991
Region(s): SS	**Location:** Hay River

Tourism development plan for Hay River
This project involved working with members of the community of Hay River to update their tourism development plan. Our interviews and observations indicated that the community possesses many opportunities to become a go-to destination for travelers who are already in the north. A strategic plan and two presentations about the plan were made to the community about our findings, including recommendations for future development.

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File No: 12 404 726	**Licence No:** 14865
Region(s): IN	**Location:** Inuvik; Tuktoyaktuk

Strategic environmental assessment roles and stakes in arctic oil and gas exploration and development
Canada's Beaufort Sea is rich in oil and gas resources. Currently, 'environmental impact assessment' is the tool of choice for assessing and managing the impacts of development in the offshore. The problem is that this approach looks only at each project, one at a time, and does not address the total or cumulative impacts of offshore development on the ecosystem or on communities. Neither does it plan for development, explore different development options, or identify the potential impacts of each, in order to determine how best to move forward in the planning and development of the offshore. In 2004 the Inuvialuit Game Council wrote to the federal Minister of the Environment, requesting a more regional and 'strategic environment assessment' of future energy development in the region. Although the Beaufort Region Environmental Assessment (BREA) was recently launched, its focus remains, like previous efforts, on data collection, as opposed to regional planning for the future. Norway, the United Kingdom and Atlantic Canada all have formal systems for strategic environmental assessment offshore,

but no such system exists in Canada's Arctic. This research examined government, industry, environmental, and Inuvialuit perspectives on the need for, benefits of, and risks associated with strategic environmental assessment in the Beaufort Sea. Results indicate a number of opportunities, including:

- improved regulatory efficiency for proponents.
- better regional science and planning practices.
- improved northern influence over future development.
- an opportunity to assess cumulative effects.
- more meaningful project-based assessment.
- greater certainty for industry.

At the same time, there are a number of perceived risks, including:

- foregoing anticipated development opportunities.
- the loss of flexibility in decision making.
- adding another layer of bureaucracy.
- the uncertainty of a new approach.

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File No: 12 410 897
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Region(s): IN
Location: Inuvik

Inuvialuit language and identity: perspectives on the symbolic meaning of Inuvialuktun in the Canadian western Arctic

The purpose of this study was to examine how Inuvialuit beneficiaries in Inuvik felt about the importance of Inuvialuktun, especially in relation to their own cultural identity. This information was intended to help Inuvialuit language planners and instructors in promoting Inuvialuktun. The study consulted 45 Inuvialuit beneficiaries between the ages of 6 and 59. Data was gathered through interviews, group meetings, and questionnaires conducted with individuals who were part of the college, learning centre, secondary school, and the community at large. The study identified some separation in the beliefs held by individuals about their heritage language. While some saw Inuvialuktun as a pillar of their cultural identity, others saw it merely as a benefit, while favoring land-ties as a primary sign of their cultural identity. Moreover, learning desire fluctuated according to age, peaking in young adults who were building identities to pass on to younger generations. The data also confirmed that Inuvialuktun had to compete with English on unequal terms, and within a generally accepted hierarchy upheld by economic demands. Although Inuvialuktun was held in high esteem, most people were satisfied knowing only a few words, as this connected them to their heritage. Several recommendations for language revitalization were made, based on participants' insights.

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File No: 12 410 891
Region(s): IN, GW, SA, DC, NS, SS
Licence No: 14905
Location: South Slave; Dehcho; Tłįchǫ; Sahtu; Beaufort-Delta; Yellowknife

Teacher performance appraisals: A tool for teacher growth and improvement

The objective of this qualitative research is to explore how current methods of teacher performance appraisals contribute to teacher growth and improvement over time in the Northwest Territories (NT). Teacher perceptions about the value, benefit, and purpose of teacher performance appraisals are being analyzed. This study attempts to generate data about the amount of time, energy, and effort that teachers put into annual performance appraisals and how teachers act upon the recommendations and feedback provided by the principal.

Interviews were conducted with 24 teachers in the K-12 education system in the NT. The interviews consisted of several open-ended questions designed to have teachers share their perceptions about their own experiences with performance appraisals and the motivational value of these appraisals. The subjects were selected to include teachers with varying amounts of experience as teachers in the NT and to ensure that they have experience with teacher performance appraisal practices in the NT. Teachers interviewed came from the South Slave, Dehcho, Tłįchǫ, Sahtu, Beaufort-Delta and Yellowknife regions.

The interviews have all been completed at this point in time. Data from these interviews is being compiled and analyzed currently. It is anticipated that data analysis will continue into early 2013 with research being completed by the end of 2013.

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File No: 12 410 904
Region(s): GW,NS
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Location: None

Learning the language of the land: The representation of land in web-based indigenous language education

This research focused on connections between indigenous languages and land, incorporating a synthesis of current literature, interviews with indigenous language and culture experts, and a survey of indigenous language education websites. Essential ties between land and language were demonstrated to be integral parts of indigenous cultures. These ties were explored in the framework of an intimate relationship with the land that involves living on the land, learning from the land, belonging to the land, and respecting the land. The current situation of language, territory and culture loss that indigenous communities face has influenced that relationship in many ways, affecting all aspects of indigenous life and culture.

These ties between language and land were then considered in an educational context through a survey of 14 indigenous language education websites from within Canada and the United States. The survey revealed that all aspects of the relationship to the land, as described above, appear in different ways on the websites, and that there are many opportunities for more fully representing land in online education. The research showed that indigenous languages have a complex and deep connection to the land that is essential to indigenous culture and that plays a significant role in online language education.

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File No: 12 410 650
Region(s): IN
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Location: Aklavik; Ulukhaktok; Paulatuk

Adaptation planning for climate change in Ulukhaktok, Paulatuk and Aklavik, NWT

This project worked with community members in Paulatuk, Ulukhaktok and Aklavik to continue adaptation planning for climate change. Workshops were held to identify how climate change is affecting the communities and adaptation options. Opportunities to include adaptation in community plans/decision making processes were identified and adaptation actions were prioritized. A landscape scientist worked with community public works and housing to address climate risks affecting community infrastructure. Community adaptation plans were produced for each community, as well as landscape hazard maps for Ulukhaktok and Paulatuk.

In Ulukhaktok, a workshop on cruise-ship tourism was held to document community concerns and opportunities related to increasing cruise-ship tourism. An oral history project was developed in partnership with the Inuvialuit Cultural Resource Centre and Helen Kalvak School to help preserve, organize and make oral history accessible within the community (www.nauvikhaq.com).

In Paulatuk, where food insecurity was highlighted as a priority concern, a community kitchen series was piloted in collaboration with the community counselor and local volunteers. The series presented an opportunity for food-insecure families to learn and prepare new, nutritious recipes using affordable ingredients (ingredients were free for participants), as well as a space to discuss food security challenges and pose nutrition questions.

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File No: 12 410 859
Region(s): IN, GW
Licence No: 14878
Location: Aklavik

Intergenerational resilience in Aklavik, NWT

In February 2011, Andrea Rawluk returned the preliminary results from her Masters research to Aklavik. Interview transcripts were returned to everyone that participated in the project. As well, Rawluk presented the preliminary results to the Aklavik Renewable Resource Council (RRC) on March 10, 2011. The results were also shared with anyone who was interested at a combined community workshop and community feast held at the Moose Kerr School. The preliminary results suggest that Gwich'in and Inuvialuit elders define resilience similarly to other indigenous cultures, whilst offering additional perspectives. Fewer youth reported having traditional language, knowledge and spirituality than elders, but expressed a desire to learn them and described spiritual experiences. All generations had similar perspectives about what changes were negative and positive for the community and the land and how they would like to see the future of the community. At the workshop, Rawluk received feedback from some community members and decided to ask three community elders to participate in longer interviews during her stay. In these interviews, the elders described that love, spirituality, and patience were at the foundation of resilience for the people of their community. Since the sharing of the results with Aklavik, the thesis has been completed.

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File No: 12 410 852	**Licence No:** 14860
Region(s): IN	**Location:** Sachs Harbour

Arctic contaminants: Exploring effective and appropriate communication between Inuvialuit communities and researchers
In November 2010, collaborative surveys were created but responses were low. Compared to interviews, which offer richer descriptions and context, it was determined that the surveys were better suited for use as pilot studies and were discontinued. Interviews were completed in June 2011, representing 27% of the Sachs Harbour population. Focus groups were not to begin until the target range (25-30%) was met. Verification of transcripts with participants is in progress. In November 2011, focus groups were going to start, but funding issues prevented this. To finish the project and deliver on set objectives, arrangements are being made for January/February 2012.

Themes identified in interviews include: relationships with researchers (positive/negative/neutral impressions of interactions, frequency/duration of time in community); conceptions/perceptions of contaminants (yes/no concerns/risks, local knowledge of what contaminants are/look like, etc.); methods of communication (positive/negative impressions, recommendations). Some people found the information presented by researchers to be helpful, informative and easy to understand; however, some found it to be confusing and complicated. Most locals acknowledge the importance of learning about contaminants, especially for future generations. Meetings and presentations by researchers are viewed positively because researchers are visible in the community, but spending time one-on-one or in small groups using storytelling and pictures are potential ways to better communicate the importance of contaminants on a local level.

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File No: 12 410 855	**Licence No:** 14972
Region(s): NS	**Location:** Yellowknife

Alternatives north: A history
No research was conducted under this licence in 2011.

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File No: 12 410 210	**Licence No:** 14922
Region(s): NS	**Location:** Behchokò

Tłįchǫ on-line and print dictionary
This research has resulted in updating of the Tłįchǫ Yatìi Multimedia Dictionary (online at http://tlicho.ling.uvic.ca)) and the development of the iPhone/iPad/iPod application called "Yati", released in May 2012 (download it at http://itunes.apple.com/ca/app/yati/id525154015?mt=8). Researchers of the Tłįchǫ Community Services Agency and the Department of Linguistics, University of Victoria, worked together in increasing the number of words in these dictionary formats and recording sounds for these "talking dictionaries". The researchers produced a set of instructions on how to use the dictionary.

A dictionary is an on-going project and the goal is to continue dictionary work into the future.

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File No: 12 410 845	**Licence No:** 14861
Region(s): SA, NS	**Location:** North Slave; Sahtu

The genographic project: Anthropological genetic analyses of indigenous human populations of North America - North Slave and Sahtu Dene field research
Results show that more than 94% of individuals from the Gwich'in and Inuvialuit communities have maternal DNA that is indigenous, with the remainder as non-native lineages. While they did share some maternal DNA, the Inuvialuit are largely genetically distinct from the Gwich'in. This genetic difference is

supported by a geographic gradient and suggests that two distinct prehistoric migrations may have contributed to the gene pool of the contemporary Inuvialuit. This sheds new light on the migrations by Inuit peoples across the Arctic over the past several thousand years.

Some 65% of male individuals had Y-chromosomes with indigenous DNA markers, with the remainder from non-native lineages. The Y-chromosome data also suggests that Canadian Eskimoan- and Dene-speaking populations are genetically distinct from one another. We found one paternal lineage that is unique to the Inuvialuit and another unique to the Tłı̨chǫ. We also found that the Tłı̨chǫ are genetically distinct from other Athapaskan groups, including the Gwich'in. This high-resolution analysis shows that Y-chromosomal diversity among the first Native Americans is greater than previously recognized. Interestingly, the Y-chromosome DNA that is unique to the Inuvialuit is present in all Eskimoan speaking populations studied (Yupik, Inupiat, Inuvialuit), suggesting it represents a founding male lineage for all of these circumarctic populations.

We are in the process of writing and publishing our results, which will be co-authored with members of the aboriginal communities and other NWT researchers involved in this research.

We have uploaded all of the results to the project database so that anyone who participated can see their own DNA test results online. We have mailed results for the maternal study to all participants, although a few were returned because of address changes. We will send reports for the paternal results by December 2012. These have been delayed due to turnover in laboratory personnel.

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File No: 12 410 845
Region(s): IN, GW

Licence No: 14862
Location: Inuvialuit Settlement Region; Gwich'in Settlement Region

The genographic project: Anthropological genetic analyses of indigenous human populations of North America

Our results show that the vast majority of individuals from the Tłı̨chǫ communities have maternal DNA that is indigenous. While sharing some maternal DNA with the Gwich'in, the Tłı̨chǫ were genetically distinctive.

Some 65% of Tłı̨chǫ male individuals had indigenous paternal DNA (Y-chromosome), with the remainder representing non-native lineages. Like the Gwich'in, the Tłı̨chǫ had genetic markers that also appear in Athapaskan speaking populations in Alaska. Interestingly, we also found one paternal lineage that was unique to the Tłı̨chǫ. The population history of Athapaskan speakers appears to be rather complex, with the Tłı̨chǫ being distinctive from other Athapaskan groups, including the Gwich'in. This high-resolution analysis further makes clear that paternal DNA diversity among the first Native Americans is greater than previously recognized.

In addition to these questions, the data also provide new details about the phylogeography of Athapaskan (Dene) peoples, including their origins and pattern of dispersal across the circumarctic region. They also allow us to test theories about Dene prehistory based on linguistic evidence. Furthermore, by combining the genetic data with genealogical, ethnographic and historical information from the region, we will be able to expand our understanding of the recent history of aboriginal communities from the Mackenzie River valley and Great Slave Lake region.

Based on these results, we are in the process of writing and publishing several papers describing our findings. We have uploaded all of the results to the project database so that anyone who participated can see their own DNA test results online. We have also mailed results for the maternal study to all participants, although a few were returned to us because of address changes. We will send reports for the paternal results by December 2012. These have been delayed due to turnover in laboratory personnel.

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File No: 12 410 845	**Licence No:** 14863
Region(s): DC, SS	**Location:** South Slave; DehCho

The genographic project: Anthropological genetic analyses of indigenous human populations of North America - South Slave and DehCho
No research was conducted under this licence in 2011.

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Region(s): SA	**Location:** Délı̨nę

Mapping, language and stories in Délı̨nę
The mapping, language and stories program is an outgrowth of research initiated in 2006. Funding was obtained to conduct research about land-based language, stories and spatial knowledge, focusing on the five themes of climate change, abandoned mines, health, the social economy, and governance, under the working title *Learning About Changes.* During the summer of 2011, doctoral research was conducted by Ingeborg Fink (Endangered Languages Documentation) and Sarah Gordon (Health, Healing, and the Stories of the Sahtu´ot’i?ne?). This phase was also a period of analysis and synthesis of previous research, leading to collaborative development of a framework for future research under the working title *Stories and Songs as Policy.* Co-authored presentations were made at the results conference of the

Social Economy Network of Northern Canada (SERNNoCa); Strategies for Moving Forward, the 2nd International Conference on Language Documentation and Conservation (ICLDC); the Pan-Arctic Results Workshop of the Climate Change and Health Adaptation Program for Northern First Nations and Inuit Communities; and People in Places: Engaging Together in Integrated Resource Management. Contributions were made to two forthcoming books, a special issue of Rangifer journal, *Sustaining Caribou and their Landscapes — Knowledge to Action*, as well as a Health Canada *Success Stories* booklet and website.

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Region(s): IN,GW,SA,DC,NS,SS
Location: All communities

Mapping the social economy in northern Canada - Northwest Territories project
No research was conducted under this licence in 2011.

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File No: 12 410 903
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Region(s): NS
Location: Yellowknife

Taiga Adventure Camp feasibility study
The goal of the project was to examine the possibility of offering a new service in the Northwest Territories (NWT). To accomplish this, the market, stakeholders, company capability, and financial considerations were studied.

A survey was given to men that live in the NWT. The survey was done in paper format and consisted of a series of closed and open-ended questions. The survey was used to determine if the people responding would like the suggested service, if they have had any previous experience with a similar service and if they would be interested in using that service again.

The results of the survey helped determine the demand for the proposed service. A report was submitted to the client as part of an overall project to help the client figure out if it is worth offering the new service.

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File No: 12 410 875 **Licence No:** 14868
Region(s): IN, GW **Location:** Inuvik; Yellowknife; Aklavik; Tuktoyaktuk

Environment, commerce, and science in western Arctic history
Research was conducted while living in Inuvik between January 1, 2011 and June 7, 2011. Information was collected in the following ways: speaking with Inuvik residents, visiting certain places in the Beaufort-Delta, and spending considerable time in the town's libraries, especially the Inuvialuit Cultural Resource Centre and the Inuvik Centennial Library. Archives and other libraries that hold records pertaining to northern history still need to be visited. Consequently, final research results are not available.

Some relevant results concerning the history of reindeer herding in the area were presented to Inuvik high school students. Additional information regarding the history of exploration in the area was shared during a five day field program in Ivvavik National Park.

The central questions guiding the research include the following:
1) Since the late 1860s, how has scientific research shaped the land of the western Arctic, a region which includes the Arctic portions of the Northwest Territories, Yukon Territory, and Alaska?
2) What have been arctic science's relationships with federal governments, private industries, and native communities?
3) How has scientific knowledge about arctic environments changed over time?

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File No: 12 410 815 **Licence No:** 14978
Region(s): IN **Location:** Paulatuk; Yellowknife; Inuvik

Lands, lakes and livelihoods: women's subsistence fishing in Paulatuk, NT
This research will investigate the ways people talk about, and practice, fishing in Paulatuk, NT. The methods will include participant observation, apprenticeship, oral history and archival research. This work will inform anthropological understandings of women's harvesting activities in northern Canada, and will generate detailed, locally informed data on people's relationships with the environment in the past and the present in the community. I believe that research on women's subsistence practices can provide insight into contemporary relationships between people and the environment.

In 2011, archival work was conducted at the Hudson's Bay Archives in Winnipeg. I am currently transcribing the notes that I took while working with the Hudson's Bay outpost journals from Letty Harbour between 1932 and 1934, as well as some notes from the Fort Anderson journal (1861). I am working closely with Anne Thrasher to share these notes. I plan to return to the Hudson's Bay archives in 2012 after fieldwork in Paulatuk, and will work closely with local residents to co-ordinate ways to obtain photos of the journals so that they may be shared with the community. This is in addition to the joint archival work that I will do with a community member at the Prince of Wales Northern Heritage Centre in Yellowknife in 2012.

I plan to travel to Paulatuk in early January in order to begin consulting with local community members about how to proceed with the remainder of the project (ie: interviews, fishing, workshops).

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Region(s): IN **Location:** Aklavik; Inuvik; Tuktoyaktuk

Dwelling off-grids
Our world is a watery world, but despite this fact geography has largely evolved as a landlocked discipline. If we are serious about reversing geography's land-centric bias, we should not erect boundaries amongst water worlds or between land and water. Fieldwork was conducted during the month of February 2012 to study off-grid living in Canada's Northwest Territories. Research included participant observation and 15 interviews conducted in the Mackenzie Delta region of Canada's Northwest Territories, and Inuvik in particular.

Ice roads are an intricate assemblage of trails carved by human movement and by the movements of water across the seasons. The ice road meshwork is a mutating, temporary, ephemeral, landscape, embedded within its environment. Indeed its formation is an event—turning water into a land-like icescape.

As river and ocean waters meet cold air, ice roads form and change. As sun rays shine on ice roads, their surfaces change. As water accumulated in the shape of snow meets winds, snowdrifts begin to form, confusing distinctions between road and snow banks. It is by recognizing the transformational flows of water and by working with the uniqueness of these changing materials that inhabitants of the Mackenzie Delta region (and us visitors) can use roads and thus access each other's communities and the rest of Canada. It is by taking part in the region's constant self-transformation that they create and follow their roads, routes, and trails, the territorialization of the ice road meshwork. Then liquefaction is an event leading to its deterritorialization and to the emergence of a delta that is no longer drivable but navigable. Whether congealed or liquefied, frozen solid, muddy, or in the midst of breaking up or thawing out, the water-land-air meshwork reveals to us a domain of entanglement open to different relations with humans for different access assemblages.

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Region(s): NS **Location:** Yellowknife

Collaboration: NWT sport and recreation sector

The sport and recreation sector in the Northwest Territories (NWT) consists of many relationships and contractual agreements. Within the sector, many organizations are responsible for providing programming to improve the lives of NWT residents through physical activity, sport and recreation.

This research project examined effective collaboration between one government division and one program delivery non-government organization within the NWT sport and recreation sector. Through a series of one on one interviews and a facilitated focus group, it was determined that effective collaboration is based on an evolution of relationship.

Resulting recommendations provided to the government division propose that value be placed on development opportunities for staff while investing in a structure which will support staff in their collaborative activities. Specifically, recommendations included: building staff interpersonal skills; learning by engaging staff in internal collaborative projects and then shifting to a sector-wide focus; and declaring and aligning personal, divisional and organizational values to create and foster a shared vision.

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File No: 12 410 873
Region(s): SS
Licence No: 14864
Location: Fort Resolution

Human dimension of river resource development and transboundary water security in the Peace-Slave River Basin

In August 2011, I returned to Fort Resolution to continue my fieldwork. During this time, I followed up with the research participants I interviewed in 2010 and was able to participate in both Cultural Week and Deninoo Days. I was not able to meet with each person that I had previously interviewed, so I will be returning to Fort Resolution in 2012 in order to follow-up with the research participants I missed in August 2011. My research is progressing well and I am looking forward to returning to Fort Resolution, to not only complete my project but to re-connect with the community members who welcomed me warmly and gave me their encouragement.

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File No: 12 410 894
Region(s): SA
Licence No: 14927
Location: Délı̨nę; Great Bear Lake

The biology and ecology of sympatric polymorphic lake trout, *Salvelinus namaycush*, in Great Bear Lake, Northwest Territories

Stock assessment monitoring research has been conducted on the lake trout in Great Bear Lake since 2000. In order to investigate the occurrence of four forms of shallow-water lake trout, however, many questions remained regarding lake trout ecology.

With the collaboration of the Délı̨nę Renewable Resources Council, a focus group was held with six participants from the community, followed by individual interviews. Both the focus group and individual interviews involved a mixed method of semi-directed and structured exchanges on lake trout distribution, movement, habitat, diet and morphology. A slide presentation about the scientific research on this subject was offered to participants at the beginning of the traditional knowledge study. Documentation tools, such as Google Earth, photos, audio recordings, projectors and transcription, were used to facilitate the study. A post-study validation process asked the people from the community to verify all material produced to date (i.e. the poster, presentation and report).

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File No: 12 410 899
Region(s): IN

Licence No: 14967
Location: Ulukhaktok

Peary caribou and Dolphin Union caribou traditional knowledge in the ISR

Interviews were conducted in Ulukhaktok in September 2011 and January 2012. A total of 11 traditional knowledge holders were identified by the Olokhaktomiut Hunters and Trappers Committee and interviewed. A total of 8 interviews were done in September; a community assistant was hired to assist with the interviews, and a translator was hired for interviewees who wanted to be interviewed in their traditional language. A total of 3 interviews were done in January; a community assistant/translator was hired to assist with these interviews. All interviews were audio recorded and later transcribed. There was also a mapping component to the interviews. Maps were scanned and digitized after the interviews. There are currently no results available, as the information needs to be complied and then verified by the interviewees.

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Licence No: 14992
Location: Husky Lakes; Hendrickson Island; Peel Plateau / Dempster Highway; Aklavik; Inuvik; Tuktoyaktuk; Tsiigehtchic; Fort McPherson

Using Inuvialuit and Gwich'in observations to monitor environmental change in the Mackenzie Delta region

No research was conducted under this licence in 2011.

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File No: 12 410 865
Region(s): IN

Licence No: 14867
Location: Aklavik; Inuvik; Ulukhaktok; Sachs Harbour; Tuktoyaktuk; Paulatuk

Polar bear traditional knowledge for the Beaufort Sea

No research was conducted under this licence in 2011.

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File No: 12 410 821
Region(s): SA

Licence No: 14897
Location: Délı̨nę

Planning for climate change impacts on the aquatic ecosystems of Great Bear Lake and its watershed
The Déline Renewable Resources Council, with the support of the Déline Land Corporation and Indian and Northern Affairs Canada, completed a project in 2011 to investigate the impacts of climate change and commercial development on Great Bear Lake using a combination of scientific and traditional knowledge.

We conducted a review of the relevant scientific literature, completed a climate change model for Great Bear Lake, and discussed traditional ecological knowledge of Great Bear Lake and climate change impacts during a series of workshops with Déline elders and hunters. The information collected was integrated in our evaluation of the vulnerability of Great Bear Lake to climate change impacts and commercial development, and informed the design of a community-based water monitoring program. The vulnerability assessment and other project materials are available on the project website at www.greatbearlake.org.

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File No: 12 410 522
Region(s): SA

Licence No: 14984
Location: Fort Good Hope

Community perspectives on the health of caribou, moose, and deer populations around Fort Good Hope
No research was conducted under this licence in 2011.

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File No: 12 410 847
Region(s): SA,NS,SS

Licence No: 14866
Location: Former Pine Point mine/townsite; Fort Resolution; Hay River; Giant and Con mine sites; Yellowknife; Dettah; Délı̨nę; Port Radium mine/townsite

Abandoned mines in northern Canada: historical consequences and mitigation of current impacts

In May 2011, the research team conducted extensive archival research on the history of Giant Mine, as well as the aboriginal employment policy in the mineral industry. Some members of the research team also worked in partnership with the Goyatiko Language Society to begin oral history interviews in Dettah and Ndilo about the historical impacts of Giant Mine. To date, Goyatiko researchers have conducted, transcribed, and translated eleven oral history interviews. A workshop will be held in Dettah in November 2011 to discuss the results of this research.

In the Pine Point area, workshops were conducted in Fort Resolution and Katlodeeche First Nation to communicate research results. During these workshops, options for community use of the research results were discussed with attendees. Options included using the results as an educational resource and as part of a community history, amongst others. A paper on the history of Pine Point has been accepted for publication in the journal "Environment and History", and will appear in early 2012.

In Délı̨nę, a graduate student spent the summer months conducting fieldwork with the goal of developing community contacts and partnerships for her research on how local people interpret artistic and media representations of uranium mining in the Sahtu region. The abandoned mines project has developed a new website, with a blog documenting our activities. You can find the blog, and post comments, at http://www.abandonedminesnc.com/.

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File No: 12 410 678
Region(s): SA
Licence No: 14904
Location: Délı̨nę

Caribou and communities in the Sahtu region

This program was initiated in response to announcements of declining barren-ground caribou herds. Activities took place in each of the five Sahtu communities in 2007-2010, along with two regional harvester workshops and an international conference (the North American Caribou Workshop, or NACW). During 2011, core activities related to this program included the following: the development of a proposal for a Sahtu regional validation workshop; a knowledge exchange including youth, harvesters and leaders through the Indigenous Talking Circle at the international Arctic Ungulate Conference; and preparation, editing and publication of the NACW proceedings in special issue #20 of the journal "Rangifer". This journal submission was titled "Sustaining Caribou and their Landscapes — Knowledge to Action", and included submissions from aboriginal authors speaking to key issues in caribou research and management.

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File No: 12 410 636
Region(s): NS

Licence No: 14965
Location: Slemon Lake

Ihda k'èti aquatic ecosystem monitoring project

The main goals of this project were to share and document Tłı̨chǫ knowledge and western scientific knowledge on the aquatic environment in Russell Lake. The project engaged local community members in sampling and recording a standard set of observations, using both Tłı̨chǫ and western scientific knowledge. It involved community members in a meaningful manner in all aspects of conducting contaminants related research, including the actual pursuit of monitoring and research objectives.

A monitoring camp was held on Russell Lake, a location that supports a strong aboriginal subsistence fishery. Water, sediment and fish were sampled by elders, youth and fisheries scientists. Elders provided assessments of fish health, and described the indicators they use to identify fish health. Scientists sampled fish tissues and demonstrated to elders and youth the methods for collecting fish tissues for analysis. A results workshop was held in Behchokö to present the results of the fish tissue analysis, water and sediment quality sampling. Community members were informed and educated on the status of contaminants in the fish they may be eating and that these foods remain healthy choices, perhaps within certain limits.

Annual implementation of the program and consistent use of the monitoring protocols developed this year will be the key to achieving the main goals of long-term monitoring: detecting change over time and space.

Svoboda, Michael
Arctic Borderlands Ecological Knowledge Coop
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File No: 12 410 811
Region(s): IN,GW

Licence No: 14989
Location: Fort McPherson; Tsiigehtchic; Aklavik; Inuvik; Tuktoyaktuk

Arctic Borderlands Ecological Knowledge Coop: community based ecological monitoring program

The Coop uses both local and scientific knowledge to monitor and assess environmental changes in the range of the Porcupine caribou herd, and nearby coastal and marine areas. Interviews with local experts are conducted every year by community researchers. People share what they see and hear about fish, berries, caribou, unusual animal sightings, weather conditions, and other things while they are out on the land.

This year was the first year that we used the reviewed and updated community questionnaire. Community interviews were completed for Tsiigehtchic, Fort McPherson, Aklavik, Inuvik, Old Crow, and Arctic Village. Also, community reports were completed and mailed to program partners and community participants at the end of 2011.

The Coop website is an important communication tool, and contains proceedings from past meetings as well as the results from the community monitoring program. Lastly, two videos were published on our website main page; the videos, along with all other documents, can be viewed at www.taiga.net/coop.

Andrews, Tom
Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2011-004 **Class:** 2
Region: SA **Location:** Tulít'a District, Sahtu Settlement Area

NWT ice patch monitoring project Tlicho

Bad weather—rain, fog, and low clouds—plagued our fieldwork this year, significantly restricting our ability to reach the ice patches by helicopter. Though we were camped in the mountains from August 15th to 18th, the weather permitted only a few hours of flying each day. Usually, this was later in the afternoon. This year, our Tulít'a partner was unable to join us due to other commitments, but his seat in the helicopter was filled by a PhD student from the University of Alberta. The student will focus his PhD thesis on the broader cultural and ecological context of ice patch use in the NWT.

As with the 2010 field season, we were shocked at the amount of melting at several sites. It seems that as the ice patches melt, they reach a critical tipping point where enough dung is exposed to dramatically change the albedo of the patch, leading to rapid melting. We have seen this in recent years, most dramatically at the KhTe-2 site. Despite poor weather, we discovered a new archaeological ice patch site, KhTf-3, at an elevation of just over 2000 metres. We recovered approximately ¾ of the proximal end of a wooden arrow from this site. the nock end was recovered, the distal end with the projectile point was not.

Bussey, Jean
Tibbitt to Contwoyto Winter Road Joint Venture

Permit No: 2011-002 **Class:** 2
Region: NS **Location:** North Slave, Tłįchǫ Settlement Area

Tibbitt to Contwoyto winter road project

In 2011, an archaeological investigation was conducted for the Joint Venture that operates the Tibbitt to Contwoyto winter road. This road runs from the south end of Tibbitt Lake near Yellowknife to almost the north end of Contwoyto Lake in Nunavut. This ice road was used every winter for over 25 years, but since the winter of 2008 to 2009 it has not been constructed north of Lac de Gras due a lack of mining activity. In previous years, a number of archaeological sites located near the winter road or its associated developments were marked by stakes to ensure avoidance during winter activities. Monitoring of the protected archaeological sites was a major component of the 2011 investigation. In addition, ground reconnaissance was done at two potential gravel sources located near Lockhart Lake camp. In total, there are seven sites that are protected from accidental impact by the installation of markers. Whenever possible, these markers are 30 m from archaeological sites, but in most instances this is not possible because the development occurred prior to archaeological investigations. Damaged stakes were replaced when necessary and the top of all markers were sprayed with fluorescent paint to make them more visible in winter.

In the process of visiting the protected archaeological sites, other portages were examined from the air to confirm their status and ensure no new disturbances have occurred in areas with archaeological potential. During the ground reconnaissance, an archaeological site with multiple localities was discovered at each of the proposed gravel source near Lockhart Lake. At the preferred source, there were four localities with primarily sparse archaeological material. A few flakes of non-quartz material were collected and the small sample of quartz flakes present was left in situ. There is little potential for significant archaeological material at this site. At the other proposed gravel source, three localities with intact archaeological material were located and all specimens were left in situ. The second gravel source has greater potential to yield intact and significant archaeological material. If this potential source is selected, more extensive testing, and possibly excavation, will be required in addition to moreground reconnaissance.

Cary, Henry
Parks Canada

Permit No: 2011-016 | **Class:** 2
Region: SA | **Location:** Sahtu Settlement Area, Délı̨nę District

Parks Canada investigations at Cloud Bay, Great Bear Lake
On 11 August 2011, two people travelled from Inuvik to Saoyú-?ehdacho National Historic Site to assess the location for a new cabin in Cloud Bay, a small inlet on the Saoyú Peninsula in Keith Arm, Great Bear Lake. The 9.8 × 6.1 m traditionally-built cabin will be used as a teaching and healing camp for elders and youth, and accessed by boat or float plane from Délı̨nę. Parks Canada had conducted an assessment for this project in 2010 on an adjacent beach, but this location was rejected in favour of building the cabin further north.

Archaeological sites have been found near the study area, most notably an early occupation found on Dog Point in 1951 , so further assessment was necessary to ensure that remains would not be disturbed during the cabin's construction. After landing on the beach in Cloud Bay and a brief search of the surrounding area, an elder from Délı̨nę selected a cobble bench approximately 160 m inland as the building site. A surface survey was conducted and the depth of the cobble was assessed. After digging below 30 cm, no archaeological deposits or artefacts were found, and the excavation was abandoned. The proposed foundation area, a section from the beach to the study area, and the high water mark nearest the proposed cabin location were mapped using GPS. On the return trip to Délı̨nę a series of oblique aerial views of the Délı̨nę Fisheries and Fort Franklin National Historic Site Designated Place were takenThe Cloud Bay cabin will be constructed in Spring 2012, and will not require further archaeological assessment.

Cary, Henry
Parks Canada

Permit No: 2011-019 | **Class:** 1
Region: GW | **Location:** Gwich'in Settlement Area

Hannah's Field archaeological assessment
In 2011, the Teetl'it Gwich'in Council wished to move two large log cabins from the Tl'oondih Healing Camp to 'Hannah's Field,' a partially vacant lot due east of the Fort McPherson Anglican Church and cemetery. There was some concern that this new construction would impact archaeological remains at the site. Although unexplored, the property was thought to have a number of features given its proximity to Fort McPherson National Historic Site, and becauseseveral finds had been made while excavating a children's playground within a hundred metres of Hannah's Field.

Two Parks Canada employees travelled to Fort McPherson on 6 October 2011 to visit the proposed construction area and determine whether archaeological excavation was necessary before the cabins were moved to the site. Despite the light snow cover, we could readily see the foundations of structures built on the proposed site in the past 100 years. We determined that the option with least impact to the archaeological remains was an on-grade pillar structure. This would involve laying a series of gravel beds on grade, which would provide a base for the horizontal wood pillars supporting the cabin structure at its corner and mid-points. We also recommended that the gravel beds be separated from the ground surface using geotextile. Since this option does not require excavation, we did not recommend that the construction be monitored by an archaeologist.

We also assessed the Historic Sites and Monuments Board plaque at Fort McPherson National Historic Site. We found the two posts holding the plaque to be rotted, and one had snapped. Additionally, the plaque's location behind the Anglican Church is not easily found by visitors approaching from the road. Since the plaque will be replaced, the community has requested that it be moved to a new location on the road-side of the church. We agree with this proposal, but suggest that any new plaque location be tested by archaeological excavation in advance.

Clarke, Grant
Aurora Geosciences Ltd. and TNR Gold Corp.

Permit No: 2011-011 **Class:** 2
Region: NS **Location:** Akaitcho Territory, North Slave Region

Moose property archaeological investigation

A Heritage Resources Impact Assessment was completed at Moose property, located on the north shore of Great Slave Lake, in advance of mineral exploration. The purpose of the investigation was to identify, record, and evaluate previously unrecorded archaeological sites and to provide recommendations to mitigate potential impacts if development sites were identified within the study area. These investigations focused on the proposed drilling locations and were carried out over two days.

The first day of field work was completed in August 2011. The second day of field work took place in September and provided an opportunity for a site visit with elders and youth representing the Łutsel K'e First Nation, the Yellowknives Dené First Nation, the Deninu Kue First Nation and the Fort Resolution Métis Council. The visit allowed the representatives an opportunity to visit the site and provide advice regarding the nature and significance of the area, and to comment on the potential of the area for archaeological resources.

No previously recorded sites were identified within the study area during our pre-field studies. Field investigations focused on areas exhibiting moderate to high potential for archaeological materials that may be impacted by the proposed development. Field methods consisted of pedestrian transects with the intent to identify and assess any archaeological sites that may be present. This included the excavation of limited shovel tests to investigate for buried archaeological materials. Much of the area investigated, however, was bedrock with little to no sediment. No precontact archaeological sites were identified and it was generally believed that the area has moderate archaeological potential at best. The abandoned workings and some machinery are still evident from the abandoned De Staffany mine and previous camp area. An area that is currently used as a camp by local people and exploration crews was also noted. A total of 11 shovel tests were excavated in these two areas, but no archaeological materials were recorded.

Clarke, Grant
The Department of Transportation, GNWT

Permit No: 2011-014 **Class:** 2
Region: IN **Location:** Inuvialuit Settlement Area

Tuktoyaktuk to Inuvik Highway archaeological investigation

The proposed Highway runs north from Inuvik to Tuktoyaktuk on Inuvialuit-owned landsas well as Crown Land. The proposed Highway measures 138 km in length in its current alignment, starting at the end of Navy Road in Inuvik (km 0) and ending in Tuktoyaktuk (km 138). The objectives of the Heritage Resources Impact Assessment (HRIA) were to identify, record and assess heritage resources that might be impacted by the proposed Highway project, and to devise appropriate mitigation strategies should any be found in conflict with the proposed Highway. The field investigations of the HRIA were completed in September 2011 over a six day period. The field crew consisted of two IMG Golder employees and four Inuvik community members who assisted during the field program and provided advice on the cultural significance of the landscape. Prefield research noted that there were no previously recorded sites within the proposed right-of-way routes. Five archaeological sites were previously recorded in areas that are potential borrow sites for gravel. The assessment was conducted along the planned Highway right-of-way and at several proposed borrow source locations. Aerial helicopter surveys were used to conduct preliminary reconnaissance to confirm areas with moderate to high potential for the presence of cultural materials. Areas deemed to have potential were ground truthed using pedestrian surveys and shovel tests. In total approximately 189 shovel tests were excavated in the study area, and one previously recorded site was revisited to identify any possible conflict with the proposed program. No artefacts were recovered from the test sites.

Clarke, Grant
Aurora Geosciences Ltd. and Boxxer Gold Corp.

Permit No: 2011-017 **Class:** 2
Region: NS **Location:** Akaitcho Territory, North Slave Region

Ven Lake property archaeological investigation

In October of 2011, Golder Associates Ltd. conducted a Heritage Resources Impact Assessment at a series of potential diamond drill locations near Ven Lake, Northwest Territories. The work was conducted on behalf of Aurora Geosciences Ltd. and Boxxer Gold Corporation. No archaeological sites have been previously recorded in the local study area, although sites are known to be present in the region.

The investigations were conducted to identify, record, and evaluate the proposed location for the presence of previously unrecorded archaeological sites, and to provide recommendations to mitigate potential impacts if sites were identified. The field crew consisted of an employee of Golder Associates Ltd. (Yellowknife) and a member of the Yellowknives Dené First Nation. Procedures used for this project were standard for projects of this nature in the region, and included pre-field studies, helicopter overflights, on-ground reconnaissance, reporting and formulation of recommendations. Project planning also included provisions for a representative of the local community to accompany the field crew during the field inspection and to provide advice regarding the nature and significance of the sites in the area. Field investigations began at an existing, and currently unoccupied, camp located on the west shore of Ven Lake. An existing series of cut lines connected the areas of investigation. Evidence of previous exploration, including bulk trenches and cleared outcrops, were noted during the assessment. The field work focused on areas exhibiting moderate to high potential for archaeological materials that may be impacted by the proposed development. These areas were shovel tested in an effort to identify any buried cultural materials or palaeosols. Because much of the area was exposed bedrock outcrops, limited shovel testing was conducted, but all completed tests were negative. No archaeological sites were recorded as a result of the investigation.

Harris, Ryan
Parks Canada

Permit No: 2011-005 **Class:** 2
Region: IN **Location:** Inuvialuit Settlement Area

H.M.S. Investigator underwater archaeological survey
No summary was provided for this 2011 permit.

Lobb, Wayne Murray
Mackenzie Valley Highway Project

Permit No: 2011-013 **Class:** 2
Region: SA **Location:** Sahtu Settlement Area, K'ahsho Got'ine District

Mackenzie Valley Highway project - Gibson Gap to Thunder River
An Archaeological Impact Assessment (AIA) was conducted near Fort Good Hope, Northwest Territories for the proposed K'asho Got'ine Highway (KGH). The proposed highway would convert the winter road from Norman Wells to Fort Good Hope into a year round road, which would then be extended northward toward Little Chicago. The goal of this project was to relocate and re-examine 13 known archaeological sites that are on or near the proposed KGH route. In addition, six other archaeological sites were to be examined at borrow sources if time was available. These 19 sites consisted of paleontological sites, historic structures, historic trails, and pre-historic archaeological sites.

The fieldwork was conducted from July 12th to 16th. The field program was carried out by hiking, boat, and helicopter at various points during the survey. Twelve sites on the main KGH route were revisited. Four of the sites were determined to be outside of the KGH right-of-way. A new paleontological site was recorded during a survey of the Jackfish Summer Trail (MbTb-12). Unfortunately, due to helicopter issues, the rest of the archaeological sites, including one on the proposed KGH right-of-way and six in borrow source locations, could not be revisited. Approximately 80 artifacts were recovered, consisting of fossils and stone tool debitage (debitage is the by-product from stone tool manufacturing). The new artifacts are from four of the archaeological sites surveyed in 2011. In addition, one of the sites on the Jackfish Summer Trail (MbTb-11) featured the remnants of at least two hearths. It is hoped that this past year's fieldwork will lay the groundwork for any future development of the KGH and borrow sources.

MacKay, Glen R
Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2011-010 **Class:** 2
Region: DC **Location:** Dehcho Region

Kakisa archaeology project

The Prince of Wales Northern Heritage Centre (PWNHC) conducted a community archaeology project in partnership with the Ka'a'gee Tu First Nation in 2011. The goal was to help the community document cultural values in the Ka'a'gee Tu Candidate Area, which is being considered for protection as a National Wildlife Area through the NWT Protected Areas Strategy. Over three days in July, archaeologists from the PWNHC worked with an elder from the Ka'a'gee Tu First Nation to document important cultural places around Kakisa Lake. A previous archaeological survey was conducted around Kakisa Lake in the late 1970s. We relocated several of the archaeological sites recorded during that survey in order to evaluate their conditions and determine more precise locations for these sites using GPS. The sites included two log cabin villages that were occupied in the 40s and 50s, and a lithic scatter located on the Muskeg River (which flows into the east side of Kakisa Lake). A small test excavation at the latter site indicates that it contains at least two precontact components. We also recorded two new sites: a precontact lithic scatter, and an historic fish camp. We hope to conduct more extensive surveys of Kakisa and Tathlina Lakes in future seasons.

MacKay, Glen R

Prince of Wales Northern Heritage Centre, GNWT

Permit No: 2011-012 **Class:** 2

Region: DC **Location:** Dehcho Region

Dehcho highways archaeology project

The Prince of Wales Northern Heritage Centre (PWNHC) conducted a community archaeology project in partnership with the Jean Marie River First Nation in 2011. The goal of the project was to document cultural values in the Łue Túé Sųlái Candidate Cultural Conservation Area, which is being considered for protection through the NWT Protected Areas Strategy. During one week in July and another week in September, archaeologists from the PWNHC worked with elders from the Jean Marie River First Nation to survey portions of two small lakes in the Łue Túé Sųlái area: Ekali and Sanguez Lakes. We recorded eight new archaeological sites, including five precontact lithic scatters, a cabin, a cache, and a trail. According to the oral traditions of the people of Jean Marie River, these small inland fish lakes were important winter harvesting areas, where fish caught through the ice and small game provided important staples for the winter months. We expect the density of archaeological sites in the Łue Túé Sųlái area to be high, and are planning more extensive surveys and test excavations for 2012.

Prager, Gabriella

EBA Engineering Consultants Ltd.

Permit No: 2011-007 **Class:** 2

Region: NS **Location:** Akaitcho Region, North Slave Region

Nechalacho rare earth element project

The Nechalacho Rare Earth Metals Project is located on the north side of the east arm of Great Slave Lake, approximately 95 km southeast of Yellowknife, with mine development focused around Thor Lake, about 4 km due north of Great Slave Lake. The archaeological team for this project consisted of two archaeologists and a local person from each of the three closest communities (Dettah, Lutselke and Fort Resolution. Archaeological investigations were conducted in August 2011, and consisted of pedestrian surveys of the proposed mine site and associated developments. During this field project, six archaeological sites were found, all along the north sides of two small lakes associated with proposed tailings containment locations. These sites are small, comprising one or two stone circles that were probably tent rings, hearths and a rock structure identified by our local crew members as a marten trap. The small sizes of the circles suggest that they probably represent one night stops by a lone traveller. These sites provide information about past people's travel routes and regional use patterns. Their presence suggests that interior parts of the study area were used more than expected. Further detailed recording and investigations will be completed at all newly recorded sites.

Three sites found during the original 1988 archaeological survey of the Thor Lake project were revisited. One is the existing exploration camp, one was a small quartz scatter and the third contained three quartz tool fragments found on different beach ridges on Great Slave Lake. Although no additional artifacts were found this year at the latter site, it is the only one that may require further work. Since it is close to the proposed dock and associated laydown areas, the site boundaries need to be defined so that impacts can be avoided if possible.

Seip, Lisa
Seabridge Gold Inc.

Permit No: 2011-006
Class: 2
Region: NS
Location: Tłįchǫ Settlement Area and Akaitcho Region

Courageous Lake

This work was conducted by two archaeologists and two community members, and was a continuation of a baseline study that was conducted in 2010. Work was focused around the southern end of Courageous Lake and the areas surrounding Matthews Lake. Community meetings were conducted with the Lustel K'e Dene, the Tłįchǫ, the North Slave Métis Alliance, and the Yellowknife Dene between March 15th and 20th. Topics discussed included archaeological baseline studies conducted in 2010 and archaeological studies proposed for the current year. Community site visits were held between August 22nd and August 25th and included members of the North Slave Métis Alliance, the Northwest Territory Métis Nation, the Tłįchǫ, and the Lustel K'e Dene. The meetings and site visits allowed community members to learn about and provide feedback regarding the baseline programs to date.

The field work resulted in the recording of 55 new archaeological sites, including 32 lithic sites, 13 rock cairns, one rock feature site, eight multi-component sites (containing a combination of lithics, rock cairns, other rock alignments, and/or historic features), and one site containing a modified piece of caribou antler. Additionally, one previously recorded site (LbNw- 3) containing two grave sites was revisited and found to be in good condition. Additional archaeological studies are planned for 2012. Avoidance is the preferred management recommendation for all sites, and if avoidance is not possible then systematic data recovery is recommended. As the project is currently in the design phase no impacts are anticipated in 2011.

Walker, Daniel
Tamerlane Ventures Inc.

Permit No: 2011-009
Class: 2
Region: SS
Location: Akaitcho Region, South Slave

Pine Point project

In 2011, archaeological investigations of the proposed Pine Point project were conducted. This project is located between Hay River and Fort Resolution, south of Great Slave Lake. Fieldwork was conducted from August 22 to September 3 under snow free conditions. The field investigations were conducted by three archaeologists and three local community members from the Deninu Kue First Nation, the Fort Resolution Métis Council, and the Hay River Métis Council. The main objective of this investigation was to identify, evaluate, and record any archaeological sites located within seven proposed deposit areas. During pedestrian surveys of the project area subsurface testing was conducted on terrain features determined to have the potential to contain cultural materials, as well as a sampling of areas determine to have low potential to contain cultural material in order to confirm that assessment. As a result of this investigation, four new prehistoric archaeological sites containing lithic material created during stone tool production were recorded.

Wickham, Michelle
Bison Historical Services Ltd.

Permit No: 2011-015 **Class:** 2
Region: SA **Location:** Tulít'a District, Sahtu Settlement Area

Slater River exploration program

In September of 2011, Bison Historical Services Ltd. carried out a survey for heritage sites southeast of Norman Wells in the Sahtu Region. The goals of this investigation were to conduct a pre-impact examination of all areas that may be impacted by 2011/2012 development activities to ensure any unrecorded heritage resource locations will be avoided, and to relocate a known archaeological site (LgRs-2). Fieldwork was based out of Norman Wells and was carried out by helicopter and on foot. Investigations focused on high potential areas within the 3-D seismic area, as well as locations where construction activities will take place (e.g. winter access road, base camp, construction camp, two helipads, security shack, staging area, two well leases, and the shoreline of fourteen water sources).

The 3-D seismic area was repeatedly overflown in systematic grids at low elevation and slow speed to identify any possible heritage concerns. A low elevation, slow spiraling over-flight was conducted at each location noted above. The majority of these locations were identified as having low heritage resource potential given some combination of low topographic relief, muskeg ground cover, black spruce vegetation, standing water and existing disturbances along the access road or existing seismic lines. The over-flights and photo documentation were deemed an appropriate level of assessment for these sites. Ten areas with high heritage resource potential (as identified during over-flights and pre-field map analysis) were further assessed through pedestrian and subsurface testing. All 180 shovel tests that were excavated yielded negative results.

Only one known site (LgRs-2) occurs close to any of the currently proposed development activities. LgRs-2 is located approximately 1.4 km north of the access road and will not be impacted by the currently proposed construction activities. LgRs-2 was recorded in 2003 as a collapsed tripod with insulators and wire, part of the CN communications line installed around 1960. During this investigation, the tripod was relocated. The insulator and wires are still in good condition; however, the wooden poles are starting to decompose. No previously unidentified heritage sites were found within the Slater River Exploration Program, so it will not impact any known heritage sites.

Abernathy, David
BHP Billiton Diamond Inc.
1102 - 4920 52nd Street
Yellowknife, NT X1A 3T1

Permit No: 5693

Region: NS

Species Studied: Caribou, Grizzly Bear, Wolves, Falcons and birds
Location: BHP Billiton property, approximately 300km northeast of Yellowknife

Wildlife effects monitoring program
The requirement for the wildlife effects monitoring at the Ekati Diamond Mine is described in the Environmental Agreement between Canada (DIAND), the GNWT (ENR) and BHP (January 1997).

Bidwell, Mark
Canadian Wildlife Service
115 Perimeter Road
Saskatoon, SK S7N 0X4

Permit No: 4821
Region: SS

Species Studied: Whooping Crane
Location: South Slave Region

Whooping Crane ecology and rehabilitation
The goal of the whooping crane recovery strategy is to protect, restore and manage whooping cranes to be self-sustaining in the wild and to downlist the species from endangered to threatened.

Carriere, Suzanne
ENR Wildlife
600, 5102 50th Avenue
Yellowknife, NT X1A 2L9

Permit No: 5764
Region: IN, GW, NS, SS, DC, SA

Species Studied: Mice, voles, lemmings, shrews
Location: All regions in the NWT

NWT small mammel and hare transect survey
Establish the abilty to predict small mammal cycles throughout the NWT.

Cluff, Dean
ENR North Slave
PO Box 2668
Yellowknife, NT X1A 2P9

Permit No: 6883
Region: NS

Species Studied: Black Bears
Location: North Slave Region

Black bear movement and ecology in the North Slave Region

No studies of black bears in the North Slave Region have been done, therefore very little information is known about these bears in the northernmost part of their range.

Cluff, Dean
ENR North Slave
Box 2668
Yellowknife, NT X1A 2P9

Permit No: 5690
Region: NS
Species Studied: Tundra Wolves
Location: Central tundra region of the NT

Index abundance for tundra-denning wolves
Management plans prepared for barren-ground caribou herds recommend monitoring for trends in predator abundance.

Coulton, Dan
Golder Associates Limited
9, 4905 48th Street
Yellowknife, NT X1A 3S3

Permit No: 6877
Region: NS
Species Studied: Raptors and water birds
Location: 15 km radius from Nico Project base camp

Baseline wildlife studies for Fortune Minerals NICO Project at Lou Lake study area
Wildlife surveys were completed, to augment existing information on wildlife species, the habitat surrounding the proposed mine site, and all-weather access road route.

Croft, Bruno
ENR North Slave
po Box 2668
Yellowknife, NT X1A 2P9

Permit No: 6878
Region: NS
Species Studied: Caribou
Location: North Slave Region

Continue monitoring the health, condition and contaminants of the Bathurst and Bluenose East caribou in the North Slave Region
Health, body condition, disease, and parasites of barren-ground caribou provide important information on the status of the herds and on the potential for population growth.

Croft, Bruno
ENR North Slave
PO Box 2668
Yellowknife, NT X1A 2P1

Permit No: 6879
Species Studied: Caribou

Region: NS, SS

Location: Behchokò; Whatì; Gamètì; Wekweètì; Dettah; and Łutsel K'e

Continue monitoring the Bathurst and Bluenose East caribou herds

In order to insure that barren-ground caribou and caribou herds remain healthy, a number of monitioring actions must be undertaken on an annual basis, to provide decision makers with the information required to address management objectives.

Davidson, Tracy
ENR - Inuvik region
Bag Service #1 Shell Lake
Inuvik, NT X0E 0T0

Permit No: 7410
Region: IN

Species Studied: Barren-ground Caribou
Location: Range of the Tuktoyaktuk Peninsula; Cape Bathurst; Bluenose-West barren ground caribou herds

Late winter recruitment, and fall composition surveys of the Tuktoyaktuk Peninsula, Cape Bathurst, and Bluenose-West barren-ground caribou herds

Late winter recruitment survey, fall composition, and collar monitoring.

Davidson, Tracy
Gwich'in Renewable Resource Board
Box 2240
Inuvik, NT X0E 0T0

Permit No: 7420
Region: GW

Species Studied: Moose
Location: Various locations throughout the Richardson Mountains, Mackenzie Delta, Eagle Plains

Moose abundance and composition survey

This survey will provide moose population density, composition and recruitment rates and will also give important insights into the influence of habitat characteristics and human-related disturbances on moose.

Decker, Robert
ENR South Slave
173 Hay River Dene Reserve
Hay River, NT X0E 0R2

Permit No: 5404
Region: IN

Species Studied: no specific wildlife species
Location: Sachs Harbour; Ulukhaktok

Ecological regions (ecosystem classification) of the Northwest Territories arctic islands

All provinces and territories have some form of hierarchical ecological land classification that integrates climate, physiography, and biotic factors in some fashion. These classifications can be a useful tool / framework for ecosystem based resource management and land use planning, as well as for understanding the effects of climate change, cumulative effects and natural disturbances on the landscape.

Derocher, Andrew
University of Alberta
Edmonton, AB T6G 2E9

Permit No: 7425
Region: IN, GW
Species Studied: Female Polar Bears
Location: Inuvik Region

Movement and habitat use by adult female polar bears
Adult female polar bears with cubs will be caught in the southern Beaufort Sea (From Herschel Island to Baillie Islands, NT) and instrumented with GPS satellite transmitters. The study will monitor the movements and habitat use of adult females.

Elkin, Brett
ENR Wildlife
Box 1320
Yellowknife, NT X1A 2L9

Permit No: 5761
Region: IN, GW, NS, SS, DC, SA
Species Studied: All wildlife species
Location: NWT wide

Wildlife health, condition, and genetic monitoring
Although most wild animals are healthy, diseases and parasites can occassionally occur in any wildlife population. Some diseases and parasites are naturally occurring and appear to cause little problem in their host species, while others have the potential to impact wildlife, at both the individual animal and population level.

Enbridge Pipelines
Enbridge Pipelines (NW) Inc.
Box 280
Norman Wells, NT X0E 0V0

Permit No: 5760
Region: DC, SA
Species Studied: Various wildlife species
Location: Selected areas of the Enbridge Pipeline, right -of -way in the vicinity of various Deh Cho and Sahtu communities

Monitoring wildlife along Enbridge ROW
A community based wildlife monitoring program was established when pipeline operations began in the mid-1980s and ran for several years before being terminated.

English, Colleen
Rio Tinto, Diabik Diamond Mines Inc.
Box 2498
Yellowknife, NT X1A 2P8

Permit No: 5696	**Species Studied:** Caribou, Grizzly Bear, Wolverine, waterfowl and other aquatic birds, raptors
Region: NS	**Location:** Diavik wildlife study area

2010 wildlife monitoring program for the Diavik diamond mine
To monitor wildlife within the vicinity of the mine.

Fast, Marie
Canadian Wildlife Service
Box 2310
Yellowknife, NT X1A 2P7

Permit No: 6888	**Species Studied:** Marsh birds and species at risk
Region: NS	**Location:** Kwets'ootł'àà candidate protected area

Marsh bird surveys in Kwets'ootł'àà candidate protected area
Kwets'ootł'àà is a candidate National Wildlife Area being proposed through the NWT Protected Areas Strategy (Mackenzie Valley 5-Year Action Plan). As part of Step 5 of the NWT Protected Areas Strategy, an ecological assessment must be conducted, to identify the key ecological components in the candidate area, before a final decision can be made to proceed with legally designating the site.

Fronczak, David
United States Fish and Wildlife Service
Division of Migratory Bird Management
Bloomington, MN, USA 55437-1458

Permit No: 4824	**Species Studied:** Ducks
Region: NS	**Location:** Mills Lake Marsh

Western Canada cooperative preseason waterfowl banding prgram - Mills Lake Station, NT
Preseason banding of 2,000 mallards, 1,500 northern pintails, and 1,000 of all other waterfowl species.

Green, David
Associate Director CWE
8888 Univeristy Drive
Burnaby, BC V5A 1S6

Permit No: 5401	**Species Studied:** Yellow Warblers
Region: IN, GW	**Location:** Inuvik Region

Latitudinal variation in life history traits and carry-over effects of Yellow Warblers
Species with wide breeding distributions, such as Yellow Warblers, provide an excellent opportunity to study potential trade-offs among vital rates at different latitudes.

Groves, Debbie
US Fish & Wildlife Service
Migratory Bird Mgmt

Juneau, Alaska 99801

Permit No: 5403 **Species Studied:** Geese, swans, ducks, loons, gulls, terns and owls

Region: IN **Location:** Banks Island; Tuktoyaktuk Peninsula; Western Victoria Island

Aerial waterfowl surveys on Banks Island, Tuktoyaktuk Peninsula, and Western Victoria Island
Information on waterfowl abundance, distribution, and population trends in the NWT is needed to ensure that populations are conserved for the long-term use, as well as that appreciation by northern residents and all people residing within the species' migratory range is maintained.

Harpley, David
Canadian Zinc
Suite 1710-650 West George
Vancouver, BC V6B 4N9

Permit No: 5033 **Species Studied:** Woodland Caribou
Region: DC **Location:** Prairie Creek Mine

Aeiral surveys of the Prairie Creek mine access road for caribou
Canadian Zinc's's access road links the Prairie Creek mine to the Liard Highway, near Nahanni Butte, and crosses terrain that is not belived to be home range for significant caribou populations.

Hegel, Troy
Environment Yukon (V5-A)
PO Box 2703
Whitehorse, YT Y1A 2C6

Permit No: 5765 **Species Studied:** Nahanni and Coal River caribou herds
Region: DC, SA **Location:** Sahtu; Deh Cho

Population monitoring of the Nahanni and Coal River caribou herds
Recent fall composition surveys, increasing hunter traffic on the Nahanni Range Road, increasing industrial development, and reports of low numbers of large bulls are all contributing factors heightening the level of concern regarding the South Nahanni and Coal River caribou herds.

Kardynal, Kevin
Canadian Wildlife Service
5019 52nd Street, 4th Floor
Yellowknife, NT X1A 2P7

Permit No: 4822 **Species Studied:** Canada Warbler, Olive-sided Flycatcher, Rusty Blackbird

Region: DC **Location:** Protected area in the Deh Cho region, surrounding Kakisa

Nest searching in Ka'a'gee Tu candidate protected area
As part of Step 5 of the NWT Protected Areas Strategy, an ecological assessment must be conducted to identify the key ecological components in the candidate area before a final decision can be made to proceed with legally designating the site.

Kelly, Allicia
ENR South Slave
Box 900
Fort Smith, NT X0E 0P0

Permit No: 4826
Region: SS
Species Studied: Moose population
Location: Slave River Lowlands

Moose population survey - Slave River Lowlands
Moose surveys were completed when moose are found in more open habitats and snow cover is complete. Survey to collect data on age and sex composition, as well as population abundance.

Kelly, Allicia
ENR South Slave
Boc 900
Fort Smith, NT X0E 0P0

Permit No: 4813
Region: SS
Species Studied: Moose
Location: South Slave Region

Moose - baseline health survey
In the South Slave region, moose are one of the most important food animals to the communities. Understanding what types and levels of parasites and disease moose currently carry and the occurrence of new or emerging pathogens is an important first step in determining population health.

Kelly, Allicia
ENR South Slave
Box 900
Fort Smith, NT X0E 0P0

Permit No: 5757
Region: SS
Species Studied: Barren-ground Caribou
Location: communities of Lutselk'e; Fort Resolution; Fort Smith

Barren-ground caribou monitoring: population parameters, movements, distribution, health, and habitat use of the Beverly and Ahiak herds
Monitoring of the Beverly and Ahiak caribou herds is imporant to determine the status of these herds and to understand factors driving changes in herd status. This work is a part of strategy 5 of the barren-ground caribou management strategy for the northwest territories 2006-2010.

Kutz, Susan
University of Calgary
3330 Hospital Dr. NW

Calgary, AB T2N 4N1

Permit No: 5158
Region: SA

Species Studied: Caribou
Location: Sahtu Region

Community-based monitoring of wildlife health

Climate and other landscape changes may impact the health of wild animals. This research establishes ongoing wildlife health monitoring programs, in collaboration with local hunters and trappers.

Larter, Nic
ENR Deh Cho
PO Box 240
Fort Simpson, NT X0E 0N0

Permit No: 5036
Region: NS

Species Studied: Moose
Location: Deh Cho Region, includes areas north of and along the Mackenzie River

Geospatial moose survey in the Deh Cho

Concerns have been voiced over depressed moose abundance, along high use areas in the Deh Cho Region. There was unanimous agreement by all first nation representatives at the Regional Wildlife Workshop, in Fort Simpson, in September 2002, that there was a need for moose surveys, to establish some baseline information on moose densities in the region.

Larter, Nic
ENR Deh Cho
Box 240
Fort Simpson, NT X0E 0N0

Permit No: 5032
Region: DC

Species Studied: Wood Bison
Location: Fort Liard; Nahanni Butte

Nahanni wood bison population survey

The first and only survey to estimate population number of the Nahanni wood bison population was conducted in March 2004. At the time the population was estimated at about 400 adults and it was acknowledged that future population surveys would be required every 5-6 years.

Larter, Nic
ENR Deh Cho
Box 240
Fort Simpson, NT X0E 0N1

Permit No: 5031
Region: DC

Species Studied: Boreal Caribou
Location: Deh Cho Region

Deh Cho boreal caribou population monitoring

A substantial portion of boreal caribou range falls within the boundaries of the Deh Cho Region. Boreal caribou have recently been designated as threatened by COSEWIC.

Larter, Nic
ENR Deh Cho
Box 240
Fort Simpson, NT X0E 0N2

Permit No: 5030
Region: DC
Species Studied: Moose
Location: Deh Cho Region

Moose population monitoring
There were concerns voiced over moose abundance along high use areas in the Dehcho Region by all Dehcho communities during a wildlife workshop conducted by ENR in September 2002.

Larter, Nic
ENR Deh Cho
Box 240
Fort Simpson, NT X0E 0N0

Permit No: 5028
Region: DC
Species Studied: Wood Bison
Location: Fort Liard; Nahanni Butte area, in the vicinity of Liard and South Nahanni River Valleys

Monitoring of the Liard wood bison population
The Nahanni wood bison population is currently afforded a measure of protection against infection with *Brucella abortus* (causes brucellosis) and *Mycobacterium bovis* (causes tuberculosis), by maintaining a bison free zone, to prevent contact with infected bison from Wood Buffalo National Park.

Lausen, Cori
Birchdale Ecological
Box 606
Kaslo, BC V0G 1M0

Permit No: 4812
Region: SS
Species Studied: Bats
Location: Near Fort Smith

Swarming survey of bats near Wood Buffalo Nationsl Park
Bat biodiversity has not been surveyed in the South Slave Region. A hibernaculum for bats is known in Wood Buffalo National Park, suggesting bats may be overwintering in the southern part of the NWT.

Machtans, Craig
Canadian Wildlife Service, Environment Canada
Box 2310
Yellowknife, NT X1A 2P7

Permit No: 5034
Species Studied: Forest songbirds

Region: DC **Location:** Fort Liard, NT

Long-term population monitoring of songbirds at Fort Liard, NT
Data collected regarding song bird population is used for conservation management and policy decisions at Environment Canada.

Madsen, Erik
Tibbit to Contwoyto Winter Rd Joint Venture
C/O Diavik Diamond Mines Inc.
Yellowknife, NT X1A 2P8

Permit No: 5699 **Species Studied:** Caribou
Region: NS **Location:** Lockart Lake Camp

Aerial and ground-based caribou surveys of the winter road
In response to concern from community members, the Joint Venture is interested in monitoring caribou movements along and near the Tibbit to Contwoyto winter road, to obtain a better understanding of caribou presence in the area.

McCallum, Dee
Snap Lake Mine
#300, 5102 50th Avenue
Yellowknife, NT X1A 3S8

Permit No: 6881 **Species Studied:** Caribou, Grizzly Bear, Wolverines, Wolves and Falcons
Region: SS **Location:** Snap Lake

Wildlife effects monitoring program
This program is designed to detect, monitor and measure environmental effects that may impact wildlife habitat, changes to wildlife behaviour and distribution, and wildlife mortalities associated with the mine activities.

Mulders, Robert
ENR North Slave
600, 5102 50th Avenue
Yellowknife, NT X1A 3S8

Permit No: 6880 **Species Studied:** Wolverine
Region: SS **Location:** NE of Wekweètì (Daring Lake, BHP and Diavik study areas)

Wolverine DNA sampling
A DNA sampling protocol has been developed, that can estimate relative wolverine abundance across large landscapes. This technique enhances the ability to quantify relative wolverine abundance, provide trend information for wildlife monitoring programs, and is anticipated to permit the modelling and assessment for cumulative impacts of anthropogenic activity on a regional scale.

Panayi, Damian
Golder Associates
9, 4905 48th Street
Yellowknife, NT X1A 3S3

Permit No: 5700
Region: SS

Species Studied: Wolverine, Wolf, Grizzly and Black Bear, water birds, and raptor
Location: Kennady lake area

Gahcho Kué environmental monitoring
The purpose of these studies is to gather additional baseline information on wildlife in relation to the proposed Gahcho Kué project.

Popko, Richard
ENR - Sahtu Region
PO Box 130
Norman Wells, NT X0E 0V0

Permit No: 5159
Region: SA

Species Studied: Mallards and Northern Pintail ducks
Location: Willow Lake

Western Canada cooperative duck banding program at Willow Lake
Dabbling ducks are migratory waterfowl that are hunted throughout their range. Banding large numbers of ducks across their summer range before the start of the hunting season and then documenting band returns from successful hunters allows us to plot the harvest distribution.

Rausch, Jennie
Canadian Wildlife Service
5019 52nd Street, 4th Floor
Yellowknife, NT X1A 2P7

Permit No: 5402
Region: IN

Species Studied: All shorebirds
Location: Kendall Island Migratory Bird Sanctuary

Arctic shorebird monitoring program
The arctic shorebird monitoring program was initiated in response to widespread shorebird population declines noted on migration routes through southern Canada and the United States.

Reford, Stephen
Darnely Bay Resources Ltd.
1103 - 4 King Street West
Toronto, ON M5H 1B6

Permit No: 7419
Region: IN

Species Studied: Birds
Location: Near Paulatuk

Darnely Bay Resources Ltd. 2010-2012 field program - pre-activity nest surveys

Identify if birds are nesting in or near the identified drill and camp sites; identify which bird species are nesting in or near identified drill and camp sites.

Robertson, Myra
Canadian Wildlife Service
Box 2310
Yellowknife, NT X1A 2P7

Permit No: 5405
Region: IN
Species Studied: all goose species
Location: Bird sanctuary

Population management of geese and swans in the Inuvialuit Settlement Region, using aerial surveys and banding studies
Information on bird numbers, distribution, survival and productivity is needed to determine if current local and international harvest levels are sustainable and to ensure that populations are conserved for the long-term use of the Inuvialuit and other people residing or hunting within the migratory range of these species.

Sharam, Greg
Rescan Environmental Services
908 5201 50th Avenue
Yellowknife, NT X1A 3S9

Permit No: 5697
Region: NS
Species Studied: Caribou, Wolverine, Arctic Fox, Red Fox, Grizzly Bear, voles, lemming, hares, ground squirrels
Location: Couageous Lake

Courageous Lake project wildlife baseline program
Seabridge Gold is conducting mineral exploration near Courageous Lake, NT. Baseline wildlife studies were conducted in the area in 1982-1983 and 2004-2005, but this is the first year that Rescan will be conducting this work.

Wood, Cindy
Canadian Wildlife Service, Environment Canada
Box 2310
Yellowknife, NT X1A 2P7

Permit No: 6887
Region: NS
Species Studied: Herring Gulls
Location: North shores of North Arm of Great Slave Lake from Boundary Creek west to Frank Channel

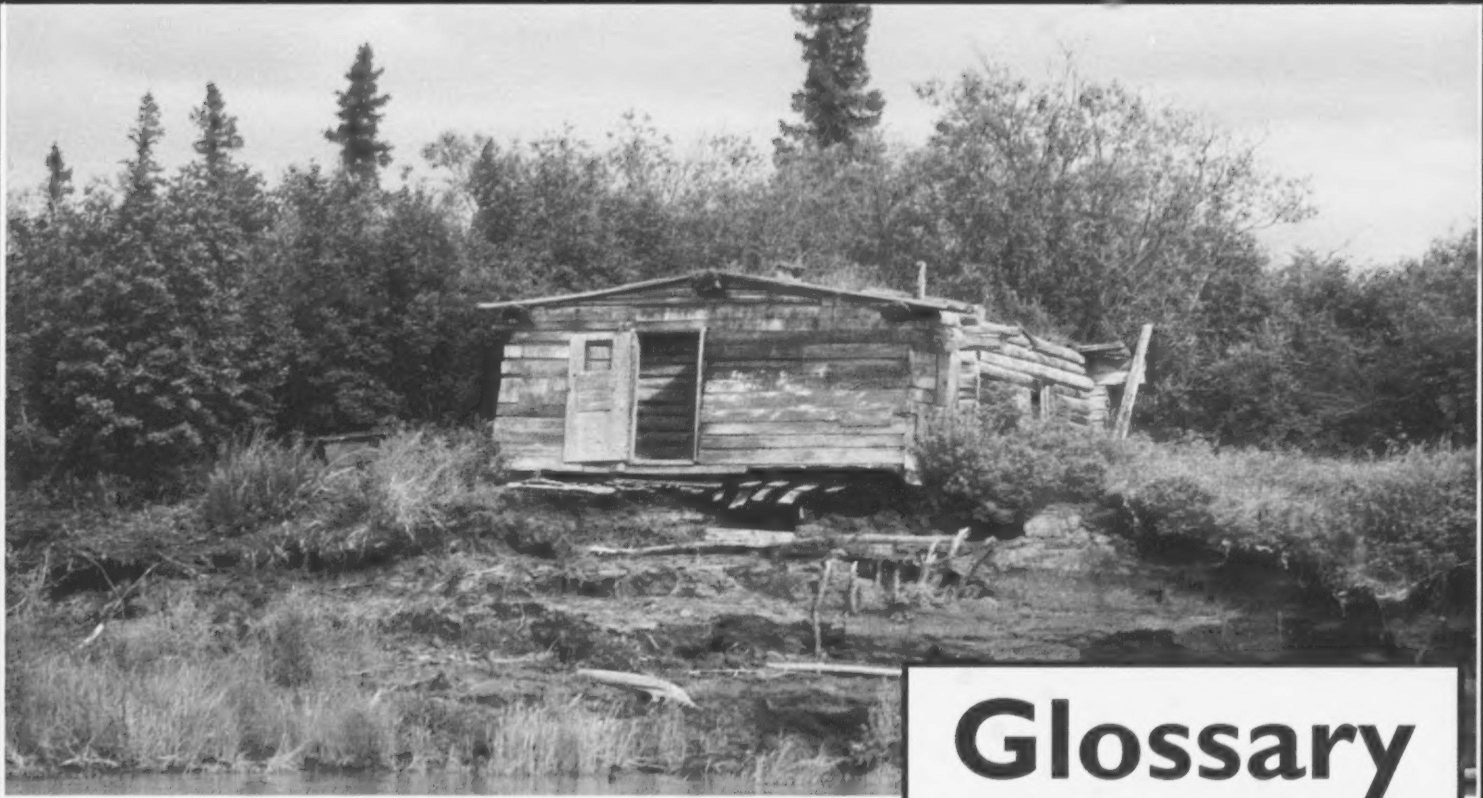
Chemical management plan wildlife national monitoring program
Herring Gulls and other gull species have been used as the typical sentinel species for contaiminants in aquatic environments for over 30 years. They are used because they are known to accumulate organic contaminants, nest in colonies, making egg collection relatively simple, and lay three eggs, but seldom rear more than 2 chicks, thus the removal of a single egg from a nest does not typically reduce breeding success.

Wortham, Jim
US Fish and Wildlife Service
c/o Canadian Wildlife Service
Yellowknife, NT X1A 2P7

Permit No: 5762
Region: IN, GW, NS, SS, DC, SA

Species Studied: Swans and ducks
Location: From southern border of the NWT to Mackenzie Delta region

Cooperative waterfowl population surveys in the Northwest Territories
Information on bird numbers, distribution, and population trends is needed to determine if current local and international harvest levels are sustainable and to ensure that populations are conserved for the long-term use and appreciation by northern residents.



Glossary

Abiotic – Not living

Active layer -The area where the soil continually freezes and thaws above the permafrost

Adaptation - A process by which a living organism (human, animal or plant) changes to become better suited to a new environment. This generally on an evolutionary timescale however, in the human context, it may be over a short period.

Adipose - Of, relating to, or composed of animal fat; fatty

Aerial - In the air

Aeromagnetic survey - Surveys from aircraft that make use of the magnetic field caused by magnetized rocks in the Earth's crust to make estimates about underlying geology of a given area such as distribution of potential resources

Algae - Simple living aquatic single or multi celled plant organisms that contains chlorophyll

Algorithm - A procedure or formula for solving a problem

Alkali - A basic substance that can range in strength

Analytical - A detailed examination of the structure or some other parameter of a substance or thing

Anoxic - A situation where oxygen is present in very low amounts or not at all, common in water

Annual - Occurs every year

Anthropogenic - Caused by a human action

Anthropology - The study of the human beings including their origins, cultures, evolution

Aquatic - Of water

Aquatic Biota - All living organisms in the aquatic environment

Arable - Land fit to be cultivated

Archaeology - The study of past human life and culture by looking at remains and artifacts like tools

Archean - A period of geologic time from about 3.9 billion years to 2.5 billion years ago

Archival - Pertaining to a collection of documents, normal over long periods of time

Arsenic - A chemical element that is gray in color and that is highly poisonous with no taste

Artifact - A historical tool, weapon or other human-made object that can be studied

Asexual - An organism that reproduces without the aid of a partner and who passes on all of its genetic information

Atmosphere - The layers of gases that surround and protect the Earth

Attributed - To explain by indicating a cause

Avifauna - the birds of a particular region or period

Bacteria - A large and varied group of single-celled microorganisms

Baseline - A set of information and data serving as a basis for comparison into the future

Bathymetry - Underwater topography. Mapping the underwater contours of the bottoms of water bodies

Beaufort Gyre - The major ice and ocean current circulation of the Arctic Ocean

Benthos - The bottom of the ocean or body of water

Biochemistry - The study of chemical processes in living organisms

Biodiversity - Pertaining to the variety of species in an area

Biogenic - Produced by living organisms or biological processes

Biogeography – The study of the geographical distribution of organisms

Biomass - The total amount of all living material within a specific volume of the environment

Biomes - Distinct areas of the Earth that are common in climate conditions, life forms and physical features like the tundra or woodland

Biostratigraphy - Identification and differentiation of rocks based on the types of fossils they contain

Biotic - Having to do with living organisms

Boreal - Relating to the forest areas of the Northern Temperate Zone that are dominated by coniferous trees such as spruce, fir and pine

Brachiopods - Any of various marine invertebrates of the phylum Brachiopoda, having bivalve dorsal and ventral shells enclosing a pair of tentacled, armlike structures that are used to sweep minute food particles into the mouth. Also called *lampshell*.

Breccia - Rock composed of sharp-angled fragments embedded in a fine-grained matrix

Brunisol Soil - soil type that is associated with forest vegetation. It is usually poorly developed and immature

Carbon^{14} – A radioactive isotope of carbon used to date ancient rocks and artifacts

Carnivore - A flesh/meat eating animal

Characterized - To describe an object or idea

Chlorophyll A - A pigment in plants that give them their green color and which absorb energy from the sun. Plants use Chlorophyll to change carbon dioxide and water into food and oxygen

Classification - Organize into groups or categories

Climate – Typical weather patterns of a region over long time periods

Community - All organisms in a particular environment

Comprehend - Being able to understand

Comprehensive - Conveying or including everything or almost everything

Coniferous woodland - A wooded area that is dominated by evergreen trees

Conifers - A group of woody plant commonly known as evergreen trees such as pine, spruce or fir that bears cones

Connectivity - As something is able to connect or relate with another thing

Core - A part removed from the interior of a mass especially to determine the interior composition

Correlated - A mutual relation between two comparable things

Cretaceous - Of or belonging to the geologic time, system of rocks and sedimentary deposits of the third and last period of the Mesozoic Era, characterized by the development of flowering plants and ending with the sudden extinction of the dinosaurs and many other forms of life

Crustacean - any mainly aquatic arthropod usually having a segmented body and chitinous exoskeleton

Cryosols - Cryosols are characterized by frozen soil within 1 metre (39 inches) of the land surface and by waterlogging during periods of thaw. They often show disrupted soil layers, cracks, or patterned surface features such as frost mounds, caused by the physical actions of ice formation and melting. Cryosols may be either mineral soils or humus-rich materials

Cryosphere - frozen water in the form of snow, permanently frozen ground (permafrost), floating ice and glaciers

Cumulative - Objects or ideas that add together

Cyanobacteria - predominantly photosynthetic prokaryotic organisms containing a blue pigment in addition to chlorophyll; occur singly or in colonies in diverse habitats; important as phytoplankton

Deciduous – A plant that lose their leaves during one season, usually winter

Deducing – To draw a conclusion

Deformation - A measurable change in structure, normally for the worse

Degradation - To reduce something or to place something at a lower level

Delta – The land formed where a river deposited silt as it enters into a larger water body, classic example, the Mackenzie Delta

Dendrochronology - A system of dating wooden objects by studying the tree growth rings

Density - A quantity of mass per unit volume

Devonian - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the fourth period of the Paleozoic Era, characterized by the development of lobe-finned fishes, the appearance of amphibians and insects and the first forests

Discontinuous – Not continuing or linked

Diurnal - Relating to or occurring in a 24-hour period; daily. Occurring or active during the daytime rather than at night

Diversion - A changing of the direction an object is going

Ecology - The science that deals with how living organisms live in relation to each other and their environment

Ecological integrity - Ensuring the relationship in plant and animal communities remains healthy

Ecosystem – The organisms present in a defined area and how they interact with the non-living surrounding (the biotic and the abiotic)

Effluent - A pollutant that flows out from a main source, such as sewage or waste matter

Ekman Grab - A box core type of sediment sampling device.

ELC data - Ecological Land Classification data

Electrofishing - Using electricity to stun and kill fish, usually used during scientific scenarios

Electromagnetic - Magnetism that is caused by electricity

Emissions - A water product that is radiated outward or discharged from a source

Endocrine – 1) designating or of any gland producing one or more hormones 2) designating or of such a hormone

Endophyte - An organism, especially a fungus or microorganism, that lives inside a plant, in a parasitic or mutualistic relationship

Environment – An organism's physical surroundings

Epoch - A period of time during which something important developed or happened

Erosion - Group of natural processes (weathering, disintegration, abrasion, corrosion, transportation) where the Earth's surface is worn away and removed

Eskers - A long, narrow ridge of coarse gravel deposited by a stream flowing under a decaying glacial sheet of ice

Estuary - A place where coastal seawater comes into contact with the current of a freshwater stream

Eukaryote - any member of the *Eukarya*, a domain of organisms having cells each with a distinct nucleus within which the genetic material is contained. Eukaryotes include protoctists, fungi, plants and animals

Eutrophication – The enrichment of aquatic systems, promoting dense algal and plant growth in a body of water, depriving the water of oxygen and forcing change in species composition

Evaporites A sedimentary deposit that results from the evaporation of seawater

Evolution - A process where different species come into existence by differentiation and genetic mutations from common ancestors over a long period of time.

Excavated - Extracting or revealing something by removal of the surrounding earth

Fauna - Animal life of a particular region, environment, or geological period

Fault - A fracture in a rock along which the rocks move; the place of origination of seismic activity; types include: strike-slip and thrust

Fecundity - Ability to reproduce

Fen - Low, flat, swampy land; a bog or marsh

Flora - The plants of a particular region, environment or geological region

Fluvial - Pertaining to something's existence or growth around a stream or river

Fossil -Trace of an organism of a past age, embedded and preserved in the Earth's crust

Fry – Infant fish

Fungi - A kingdom of heterotrophic organisms that produce spores

Fyke - A long, bag-shaped fishing net held open by hoops

Gas hydrates (clathrates) – Crystalline water based solids physically resembling ice, in which small non polar molecules (typically gases) are trapped inside "cages" of hydrogen bonded water molecules

Gender - One's characteristics or traits determined socially as a result of one's sex

Genetic - Pertaining to an organism's traits or characters being linked to genes

Genera - A group of organisms that share common characteristics

Geochemistry - The science that deals with the chemical composition of and chemical changes in the solid matter of the Earth

Geochronological - The chronology of the earth's history as determined by geologic events and not by human history

Geomorphologic - Pertaining to the physical features of the Earth's surface

Glauconite - A greenish mineral of the mica group, a hydrous silicate of potassium, iron, aluminum, or magnesium

Gonad - a gland in which gametes (sex cells) are produced

Grams (g) - A unit of measurement for mass

Habitat - A place where organisms live

Hepatic – (Anatomy) of or relating to the liver; (Botany) *botany* of or relating to the liverworts

Heterogeneous - A situation where something is in a mixed composition

Holocene - The most recent 11,000 years of the Earth's history starting at the end of the last major iceage, which has been relatively warm

Hydraulic - Pertaining to movement caused by water

Hydroacoustic survey - An echo-sounding (SONAR) survey used for measuring such things as fish stocks, water velocity, etc.

Hydrocarbon – A molecule containing hydrogen and carbon, often petroleum, natural gas and coal

Hydrograph - A graph showing the water level, discharge, or other property of river volume with respect to time

Hydrology - Science dealing with the properties, distribution and circulation of water

Isotope - Atoms that have nuclei with the same number of protons (as the atomic number) but different numbers of neutrons

Igneous - A rock or mineral that solidified from molten or partly molten material, i.e. from magma; one of three rock types with metamorphic and sedimentary

Implement - To put into effect

Iron - A metallic element used for making tools and essential for all living organisms' survival

Jarosite - a yellow to brown secondary mineral consisting of basic hydrated sulphate of iron and potassium in masses or hexagonal crystals

Kimberlite – An igneous that forms in volcanic pipe, an indicator of diamond deposits

Larvae - A premature stage for an insect where it feeds before becoming a pupa

Latitude - A measurement of the from the equator to a given point on the Earth's surface in the north and south direction

Laurentide Ice Sheet - Principal glacial cover of North America during the Pleistocene Epoch (2.6 million – 11,700 years ago). At its maximum extent it spread as far south as latitude 37° N and covered an area of more than 5 million sq mi (13 million sq km). In some areas its thickness reached 8,000 – 10,000 ft (2,400 – 3,000 m) or more

Ligotrophic (oligotrophic) - The opposite of eutrophic. W aters having very low levels of primary productivity and (usually) low concentrations of nutrients; good, clear water quality

Limestone - A sedimentary rock that contains mostly calcium carbonate and can be formed by either inorganic or organic processes

Limnology - The scientific study of the life and phenomena of fresh water, especially lakes and ponds

Lithic - Of, like, or made of stone. Archaeological artifacts made of stone

Meristic - Having or composed of segments; segmented

Mesic - Of, characterized by, or adapted to a moderately moist habitat

Metabolism - The chemical processes occurring within a living cell or organism that are necessary for the maintenance of life. In metabolism some substances are broken down to yield energy for vital processes while other substances, necessary for life, are synthesized

Metamorphic rock - Any rock derived from pre-existing rocks by changes in response to environmental factors such as temperature and pressure over a long period of time; one of three types of rocks with igneous and sedimentary

Methane - The simplest hydrocarbon that is the main ingredient in natural gas (CH_4)

Microclimate - The climate of a small area that is different due to changes in geography

Microorganisms - Organisms that must be viewed under a microscope, such as bacteria or a virus

Migration - The long range movement of a group of animals based on the seasons

Molecular analysis - A detailed look at the chemical structure and properties of a molecule

Moraine - A mound of rock debris carried and deposited by a glacier

Multicellular – Composed of more than one cell

Nutrient – Any chemical that an organism removes from the environment to aid with growth and development; common nutrients include nitrogen and phosphorus

Otolith – A part of a fish's inner ear, often used to determine the age fish

Organic - Material pertaining to plants or animals

Outcrop - A portion of bedrock or other stratum protruding through the soil level

Overlie - Sedimentary or volcanic rock that lies on top of older rock

Paleoecological - A relationship or study of ancient organisms and how they related to their ancient environment

Paleoenvironmental - An environment that existed in the past

Parr - a juvenile fish

Parameter - One set of measurable factors, such as the temperature and pressure that define a system and determine its behavior and are varied in an experiment

Pelagic - Relating to or living in or on oceanic waters. The pelagic zone of the ocean begins at the low tide mark and includes the entire oceanic water column

Permafrost – The permanently frozen layer of soil that characterizes the Arctic's ground; there are two various types: continuous and discontinuous

Pertinent – An object, idea or concept that is relevant to the topic

Phylogeography - the study of the historical processes that may be responsible for the contemporary geographic distributions of individuals

Phylum – (Biology) a major taxonomic division of living organisms that contain one or more classes. An example is the phylum *Arthropoda* (insects, crustaceans, arachnids, etc., and myriapods)

Physiological - Pertaining to the physical structures and functions of living organisms

Phytoplankton - A group of plant-like plankton that all sea animals depend on either directly or indirectly

Pingo – A large frozen mound covered with vegetation in permafrost areas

Pleistocene - An age of notable ice ages and development of humans between 2,000,000 and 10,000 years ago

Postglacial - Relating to or occurring during the time following a glacial period

ppm – An abbreviation of parts per million

Precipitation – W ater (in the form of rain, snow, hail, etc) falling from the atmosphere

Prokaryote - An organism of the kingdom Monera (or Prokaryotae), comprising the bacteria and cyanobacteria, characterized by the absence of a distinct, membrane-bound nucleus or membrane-bound organelles, and by DNA that is not organized into chromosomes. Also called *moneran*

Qualitative – A complete detailed descriptions usually taken from a small sample that allows for distinctions to be drawn from the data

Quantitative - Use of large amounts of data where statistics can be applied to interpret the data

Quaternary - Of or belonging to the geologic time, system of rocks, or sedimentary deposits of the second period of the Cenozoic Era, from the end of the Tertiary Period through the present, characterized by the appearance and development of humans and including the Pleistocene and Holocene epochs

Qiviuq - The soft downy undercoat of muskoxen

Radiocarbon dating - The determination of the approximate age of an ancient object, such as an archaeological specimen, by measuring the amount of carbon^{14} it contains

Raptor - A bird of prey such as an eagle, falcon or osprey

Regolith - The layer of loose rock resting on bedrock, constituting the surface of most land. Also called *mantle rock*

Regosol - a type of azonal soil consisting of unconsolidated material derived from freshly deposited alluvium or sands

Remote Sensing – A technique used to study locations using technology that does not require the researcher to be in the field

Revitalization - To give new life or vitality to something

Riffle – a) A rocky shoal or sandbar lying just below the surface of a waterway b) A stretch of choppy water caused by such a shoal or sandbar; a rapid

Satellite imagery - Computer images generated by a satellite which allow researchers to look at a specific area and monitor surface features such as vegetation

Sediment - Solid fragment material that occurs from the weathering of rocks. In water it is material that has settled from a state of suspension

Sedimentary rock - Rock derived from loose particles that have accumulated over time

Sedimentation - The process where small particles are moved and deposited to accumulate into layers

Seine - A large fishing net made to hang vertically in the water by weights at the lower edge and floats at the top

Seismic - Pertaining to vibrations in the Earth, both natural and induced

Shovel testing - A simple test where a sample of ground is taken by use of a shovel and examined

Species - A group of organisms that share common characteristics that group them together and also distinguish them from others

Stone flakes/chards - debris left over from a rock while making tools

Stratified - A system that is set up in layers or strata

Stratigraphic - Formation of rock where different layers can be picked out based on type and age of the rock

Subsidence - The shifting of the Earth's surface downwards (compared normally to sea-level)

Succession - A progressive change in the biological community as a result of a response from species to the changing environment

Surficial - Pertaining to something that is on the surface

Suspension - A situation where the medium is able to support the weight of the particles trapped inside it, example: silt in a river.

Symbioses – An interaction between two or more organisms that usually benefits both

Sympatric - Occupying the same or overlapping geographic areas without interbreeding. Used of populations of closely related species

Systematic - Done according to a plan

Taxonomy - The classification of organisms in an ordered system that indicates natural relationships

Thermokarst - Sinking holes, caves and underground drainage that are produced in regions with permafrost from melting of ground ice and settling of the remaining ground

Theodolite - a surveying instrument for measuring vertical and horizontal angles. Also called (in the US and Canada) ***transit***

Thermocline - Layer in a large body of water that sharply separates regions differing in temperature. An abrupt temperature gradient in a lake

Topography - A description of the surface of a given area

Trace metals - A metal that is not essential in the sample but is found in small quantities

Transect - An imaginary line across a surface where observations are made

Tributary - A stream or river which feeds into a larger body of water

Turbid - Stirred up material suspended in a medium leaving it unclear and opaque

Ungulate - Hoofed animals

Velocity - Rate of change of position; quickness of motion

Volatile - Unstable; a substance that easily vapourizes

Watershed - A region draining into a river, river system, or other body of water

Weather – Daily variable changes in temperature, precipitation, wind and other atmospheric conditions

Zooplankton - Microscopic animal organisms floating in water

210-Pb Method - is used to determine the accumulation rate of sediments in lakes, oceans and other water bodies. It is used for over a period of 100 - 200 years.

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